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CLIPPING GREEN RIVER TO AVOID HEAVY GRADING

Twenty-Five Mile Grading Contract in Western Wyoming

By H. F. JACQUES

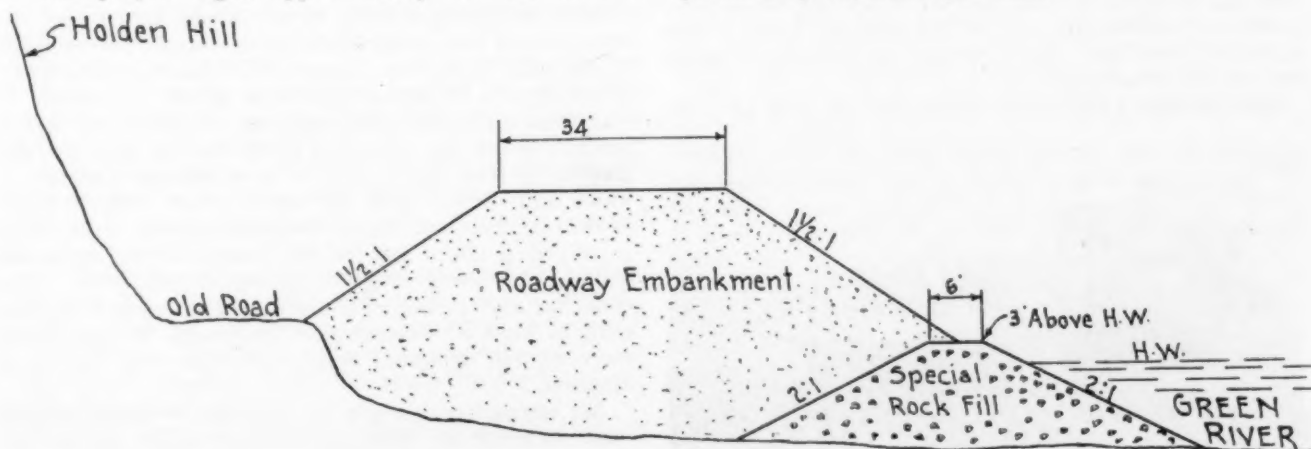
Project Engineer, Kemmerer, Wyo.

ANOTHER step towards the completion of a modern, paved highway leading directly from Salt Lake City, Utah, and all southwestern points, to Teton and Yellowstone National Parks through Western Wyoming was taken in the award, on January 26th, 1938, of a contract for grading approximately 25 miles of the Kemmerer-Jackson Hole Road by the Wyoming State Highway Commission. The U. S. Bureau of Public Roads concurred in the award, as about 19 miles of the work was through public domain and qualified as a Federal Lands Highway Project for which 100 per cent of Federal funds were available; the remainder was financed as regular Federal Aid with about 62 per cent Federal and 38 per cent State participation. The Bureau of Public Roads exercised general supervision over the construction, though actual field supervision was under the Wyoming State Highway Department's engineering personnel.

This project begins approximately 16 miles north of

the coal-mining town of Kemmerer and runs in a general northeasterly direction to the Green River Valley and thence north along the Green River to a point just beyond Holden Hill, a steep, precipitous bluff which overlooks the river about 40 miles north of Kemmerer.

Work consisted of 700,000 cu. yds. of unclassified excavation with an average haul of 375 ft., 10,000 cu. yds. of special rock fill, corrugated metal pipe, portable snow fence, right of way fence, riprap and other miscellaneous items, including watering and rolling. The special rock fill was to afford support and protection to the roadway where it became necessary to encroach upon the Green River at the Holden Hill bluff. Unit bid prices for the grading items were eleven (11c) cents per cu. yd. for excavation and one (\$1.00) dollar per cu. yd. for special rock fill. The total cost of the grading and miscellaneous items was about \$133,000.00 or approximately \$5,300.00 per mile.



Typical Section Showing Special Rock Fill
Placed in Green River at Holden Hill



Grading Equipment. Note That Last Unit Is Sheepfoot Roller Compacting Freshly Watered Section.

Though work was started early in March, the contractor was unable to make any real progress because of frozen ground and severe weather conditions until after April 7th. Work was opened up on the gravel benches which skirt the valley where weather and ground conditions would interfere least with grading operations. The equipment with which the major portion of the grading was done consisted of 6 tractor-scraper units of 12 cu. yd. capacity and 2 tractor-bulldozer units for miscellaneous work such as pioneering cuts, excavating channels, making fills near structures, and for the operation of the ripper or scarifier and the 2-drum sheep's foot roller used for compaction. A $1\frac{3}{8}$ -yd. shovel and trucks were used for the special rock fill and for about 18,000 cu. yds. of special gravel borrow at Fontenelle Creek where a long haul and soft, wet ground prevented the use of scrapers. The remainder of the excavation was handled with tractors and scrapers, including about 40,000 cu. yds. of shale and sandstone which would have been classified as Loose or Solid Rock in classified excavation.

Contractor's personnel was limited by contract to 40 hrs. time per man per week. The contractor operated the scraper equipment on an 80 hr. per week basis (2 shifts) for 8 weeks, then changed to a 120 hr. per week basis (3 shifts) for the balance of the 16 weeks necessary to complete the grading, a total of approximately 10,000 scraper-hours. All work on the contract was completed in 101 working days.

Design—Because of the severe snow conditions inherent to this latitude and altitude (average 6,800 ft.), roadway design called for a high grade line and the wide "streamlined" road sections with flat (5:1) cut slopes which characterize the Wyoming standard in snow country. These wide cut sections with flat slopes lend themselves particularly well to construction with tractors and scrapers, it being possible to operate this equipment over almost any part of the section. Only a few instances developed where it was necessary to pioneer the cuts with bulldozers.

Compaction—Particular attention was paid to com-



Sheepfoot Roller Compacting Fills.

paction during construction. Provision had been made for placing the material in 8 in. lifts and for watering and rolling each lift until satisfactory density had been achieved. Items for watering (1,000 gal. units) and rolling (hrs.) had been included in the contract and these functions were completely under the control of the engineer or his assistants. Two tank trucks, 1,000 gal. and 1,500 gal. capacity, respectively, were used for hauling water. A tractor-drawn 2 unit articulated roller with 7 in. studs on the 48 in. drums of 40 in. diameter, of such weight as to exert 150 lb. pressure per sq in. of contact, was used for compacting the material. These drums designed to be filled with liquid for added weight, were here filled with crude oil rather than water because of the freezing temperatures when work began.

Very little interference with actual excavation operations occurred because of the watering and rolling. In fact, the watering helped materially in the operation of the excavating equipment, as the allaying of dust contributed to the better vision and comfort of the operators and the compacted material offered better traction for the equipment.

Preliminary laboratory compaction tests had been made by the Proctor method with samples of the different types of soils on the project. The testing laboratory had furnished the field engineer with graphs for each type of soil sampled showing the optimum density of



Showing Construction of Special Rock Fill in Green River at Holden Hill. This Fill Was Carried About 6 Ft. Higher in 2 Lifts.

that particular soil which could be obtained by proper compaction methods and correct moisture content (optimum moisture).

Soils encountered were mostly sandy loams, and the tests showed that optimum densities, usually between 100 lb. and 120 lb. per cu. ft. could be obtained with about 15 percent to 18 percent optimum moisture content. It was then up to the field engineer to obtain as high a percentage of the indicated optimum density as was feasible by the application of a reasonable amount of water and rolling with the sheep's foot roller. Field assistants, therefore, made frequent density tests, daily, to afford a check on the percentage of the optimum which was being attained during construction. The watering and rolling was continued on each 8 in. lift until at least 85 percent and preferably 90 percent or more of the optimum density for that soil had been attained.

No attempt was made in any case to apply enough water to reach the optimum moisture content, as the cost would have been prohibitive. However, in a few instances the field moisture approximated the optimum,

and a correspondingly high percentage of optimum density resulted. In general, field moisture ran about half of the optimum, the average moisture content of 156 field density tests was 9.4 percent.

The tests showed very little rolling was necessary in the center portion of the embankments, where the operation of heavy grading equipment achieved the required compaction without rolling. Rolling was generally confined to the outer third of the embankment on each side of the center; water, however, was distributed over the entire width of fill, particular attention being given to the shoulders of the roadway.

Field equipment for making density tests consisted of the following: one 6 in. post hole digger; one 30 lb. capacity scale for weighing sand and soil; two water buckets, one of which had a round pouring spout for pouring sand directly into hole without wasting; a supply of fine (20 to 50 mesh) dry, clean sand of known unit weight; one balance, sensitive to 0.1 gram, for making moisture determinations; one gasoline camp stove or other equipment for drying samples; and a number of pans in which to place samples while drying or weighing.



Looking North at Completed Roadway Over Special Rock Fill. Three Feet of Rock Fill Remains as a Berm. Note How Opposite Bank of Green River Has Started to Erode.

Testing Procedure—Field density determinations were made in the following manner:

1. An area about three feet in diameter was leveled off on the compacted layer which was being tested.
2. A hole about 8 in. deep was excavated with the 6 in. post hole digger, every care being taken to save and weigh all material taken from this hole.
3. From a weighed bucket of the clean, dry, fine sand, the sand was poured into the hole until it was exactly and completely filled, a straight-edge being used to strike off the surface.
4. The bucket was again weighed to determine the weight of sand poured into the hole.
5. Using the weight of sand required to fill the hole and the unit weight of the sand (weight per cubic foot, dry and loose) the volume of the hole was easily computed. The unit weight of the sand was determined by weighing the amount required to fill a can of known volume, care having been exercised to pour the sand into the can from the same height and in the same manner as it was poured into the hole.
6. From the weight of material taken from the hole (2) and the volume determined in (5), the weight per cubic foot of the embankment material was determined.
7. As this material contained moisture, a small sample was weighed, dried and again weighed, and the moisture content noted.
8. The dry density was then determined, thus:
wt. per cu. ft.

1 plus % moisture



Engineering Party Sounding For Toe of Slope of Rock Fill For Re-Measurement.

9. This field density was then compared with the maximum (optimum) density indicated by the laboratory compaction test.

Results—For each type of soil, at least one construction sample, consisting of the actual material taken from the embankment for the field density test, was sent to the laboratory for comparison with the corresponding preliminary soil sample, and for a more accurate determination of the percentage of the optimum densities which was actually being achieved during construction. For 27 such samples submitted on this project, the field density percentages averaged 91.4 percent of optimum densities.

The total gallonage of water applied was 2,096,000 gallons. The roller was operated a total of 961 hours. Considerable moisture was gained from precipitation during the Spring months; if the project had been constructed in the late Summer or Fall, fully another 1,000,000 gallons would have been needed to attain comparable results.

In order to avoid the hazard of rock falling onto the roadway from the unstable slopes and high bluff of Holden Hill, the centerline of the roadway was carried a minimum of 40 cu. ft. out from the toe of the bluff. To accomplish this and maintain suitable alignment, it became necessary to encroach upon the adjacent Green River as much as 90 feet. To afford support for the roadway embankment and to protect the roadway slopes from floating ice and drift on the river, special rock fills or dikes were provided for under the embankment slopes along the river.

These dikes are parallel to the centerline and so placed that the toe of the slope of the roadway embankment falls at the center of the top of the dikes. The dikes are 6 ft. wide at the top, 3 ft. above high water, with 2:1 slopes extending down to the bottom of the river. They are stable in themselves and afford better protection than riprap or other form of revetment. The material was quarried about a mile away and was placed in the fills, "quarry run," by hand or with bulldozer, so that the larger rock was on the river side of the dike, and so the interstices of the large rock were filled with smaller rock to add to the stability of the



Type of Cut Design Used in the Snow Country Where This Road Was Built.

dikes. The roadway embankment was then completed, leaving half (3 feet) of the top of the dikes as a berm.

Those Responsible—The contract for the above work was awarded to John M. Keahey of Buffalo, Wyoming, who performed all the scraper work and miscellaneous items. The special rock fill and the special gravel borrow which involved the use of the shovel was sublet to The Wyoming Construction Company, Laramie, Wyoming.

Another contract, for gravel surfacing and oil treatment by the road mix method, has been awarded to W. W. Clyde & Company, Springville, Utah. Construction was started October 24th, 1938. By September, 1939, the completion of this 25 mile stretch of oil paving will leave only about 40 miles of surfaced, but as yet unpaved, highway on this short, direct route from the Southwest to Jackson Hole and the Teton and Yellowstone National Parks.

Monthly inspections, under the direction of B. W. Matteson, District Engineer, Bureau of Public Roads, Denver, Colorado, were made by W. H. Jeffrey, Highway Engineer, B.P.R.

For the Wyoming State Highway Commission, C. F. Seifried, Cheyenne, Wyoming, is Superintendent; Talcott Moore is District Engineer, District No. 2, Rock Springs, Wyoming; Project Engineers were H. F. Jacques and Ben Wood, Kemmerer, Wyoming.

FLASHER SIGNALS AT INDIANA CROSSINGS

Plans for the installation of flasher warning signals at approximately 80 railroad grade crossings on state highways and county roads, are being made by the Indiana State Highway Department. Completion of the plans and other preliminary steps will require several months before bids can be taken on the materials and assembly of the signals started. A partial list of grade crossings to be protected by flasher signals has been tentatively approved by the U. S. Bureau of Public Roads but announcement of the locations will be withheld until final approval is obtained. Since this type of protection for motorists was initiated several years ago, the State Highway Commission has provided for the erection of flasher signals at 300 railroad grade crossings or for modernization of existing signals. While a majority of these have been at intersections of railroads and state highways, a number of the signals have been placed on county roads and some on city streets.

METHODS AND COST OF RESURFACING JOB AT PHOENIX, ARIZ.

An interesting resurfacing project was carried out in February of last year on West Washington Boulevard in Phoenix, Ariz. The street is 60 ft. wide and the central portion carries two lanes of street railway tracks. This central section was paved with concrete and the remainder of the street was a bituminous pavement put down in 1916.

A total of 3,100 sq. yds. was resurfaced as an experimental section—one that could be watched and used as a basis for a future program. The work was complicated by the fact that the bituminous surface matched the concrete track section, so it was possible to lay only a thin coat adjacent to the tracks, as otherwise there would have been severe adverse slopes in the crown section.

How the resurfacing was done was described by J. A. McColm, Superintendent Street Department of Phoenix, in a paper presented at the 1938 Arizona Roads and Streets Conference.

An armor coat that averaged 1½ in. in thickness was laid. The coat was ¼ in. thick or less for 4 or 5 ft. adjacent to the tracks and thicker than ½ in. at the curb. The entire surface was tack-coated by application of emulsion with a hand pump. 90-95 road oil was used, plant mixed in a plant owned by WPA. All the aggregate passed the ¾ in. square mesh and 40 per cent of the material was retained on the No. 10 sieve. A mix using ½ in. maximum sized aggregate was used to fill the worst holes and served as a levelling course prior to the application of the armor coat.

The total cost per square yard in the experimental section was 25 cents and on a larger job it was estimated that this cost could be reduced by 3 cents or more a square yard, using WPA methods. Detail costs were:

	Cost to WPA Per Sq. Yd.	Cost to City Per Sq. Yd.	Total Per Sq. Yd.
Cleaning old surface:			
Hand labor	\$.0403	.....	\$.0403
Blower and compressor .....	.0048	\$.0097	.0145
Broom and Hand Tools .....	.0016	.0007	.0023
Foreman and Supervision .....	.....	.0032	.0032
Filling Holes with Surface Course Mix (4½ Tons for this job) .....	.0052	.0015	.0067
Painting or Spraying with Emulsion—575 Gal....	.....	.0185	.0185
Spraying and Spray Truck (4 hrs.) .....	.0032	.0045	.0077
Armor Coat, ½ in. Thick WPA Plant Mixed and Delivered (74 Tons) ..	.0800	.0350	.1150
Laying and Inspecting ..	.0242	.0032	.0274
Rolling .....	.0026	.0039	.0065
Clean up. Flares	.....	.....	.....
Misc. Items .....	.0065	.0016	.0081
Total	\$.1684	\$.0818	\$.2502

WPA Reports Progress on Road Construction and Repair

Construction or improvement of more than 30,000 miles of roads by workers of the Works Progress Administration in the four-month period from July 1 to Nov. 1, 1938, has been announced by Colonel F. C. Harrington, Works Progress Administrator. Most of this work was done in rural districts. In addition, Colonel Harrington reported the completion in the same period of more than 4,000 new bridges and 52,000 new culverts; the construction or improvement of 1,500 miles of sidewalks and paths, and more than 56,000,000 linear feet of roadside drainage ditches. The figures represent only projects brought to completion during the period mentioned and do not include work done on approximately 10,300 other highway projects which still were in operation at the end of the period.

Cost of Winter Maintenance in Minnesota

A total of \$949,225 was expended during the winter of 1937-1938 for winter maintenance activities on the Minnesota highway system. This was an average cost of \$83.37 per mile over the entire trunk highway system. Of the total \$302,243 was for sanding and ice control; \$423,995 for snow removal; and \$222,986 for the installation and removal of snow fences and purchase of some new fence.

SOME COMPARISONS—

Between German and American

Road Construction Equipment and Methods

By JOHN W. POULTER

*Research Engineer,
The Koehring Company,
Milwaukee, Wis.*

GERMANY'S highway program, adopted by that government shortly after 1933, was much different and on a very much larger scale than anything that country had ever attempted before. It included the construction of some 4300 miles of new national motor highways along very modern lines and the improvement of about 25,000 miles of existing roads, which meant many new equipment requirements. Because of economic conditions very little machinery could be imported, which meant that they had to develop new equipment and that this be done in a rather short time.

While in some ways their equipment development has followed along lines very similar to that with us here, there are many cases where, because of certain different influences, it has been very much different. One of the things which seems to have had the greatest effect in general design and method of operation is hauling equipment. Back of this, possibly the lack of petroleum for motor fuel and rubber for pneumatic tires has made it necessary for them to use the industrial railway all the way through construction from the start of the excavation to the completion of the slab, instead of motor operated pneumatic tired or crawler equipment which is general practice here. Also, Germany does not have an automotive industry with its mass production, making available a wide range of alloys and special features of design as we have. These have had a very definite influence on our construction equipment. This, coupled with the general tendency of the German engineer to build large heavy machinery has had a very noticeable effect. In many cases new machinery for the same type of work has been brought out by several different companies at the same time. This naturally makes many detailed differences, which, along with not too great a tendency for standardization, makes two machines which are exactly alike somewhat of an exception. As has



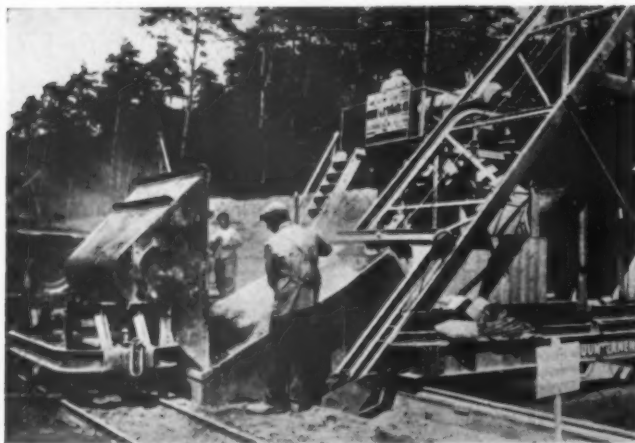
*Note How Dipper Operates in Loading Grading Material.
This Is a ½-Yd. Bucket.*

been indicated, most of the hauling all the way through the construction of a highway is done by the industrial railway. In some cases, on grade construction, the cars are loaded by hand, and if the grade is not too steep, moved by hand, but generally they are either loaded by power shovels or long conveyors fed by hand and moved by small locomotives, either steam or diesel.

Shovel Dipper—Fundamentally the power shovel used for excavation in grade construction is similar to that used here. Steam is the most common, but with a tendency toward diesel in the new models, which are mounted on crawlers, very similar to those common with us. There are many detailed differences and a general one which will be of interest is the dipper door and trip. In some cases they use a dipper with a door attached by two long arms, one on either side and near the top. To dump the load the door is swung on an arc across the bottom of the dipper, sliding from under the load. This saves height but takes considerable pull through a long distance to dump the complete load. Another method is to use a system of gears and a brake drum attached directly to the back side of the dipper. A spring loaded brake holds the door in closed position and to dump the load this brake is released instead of using the latch as is common practice here. They use some large shovels, but most of those on highway work are about one-half cubic yard in size.

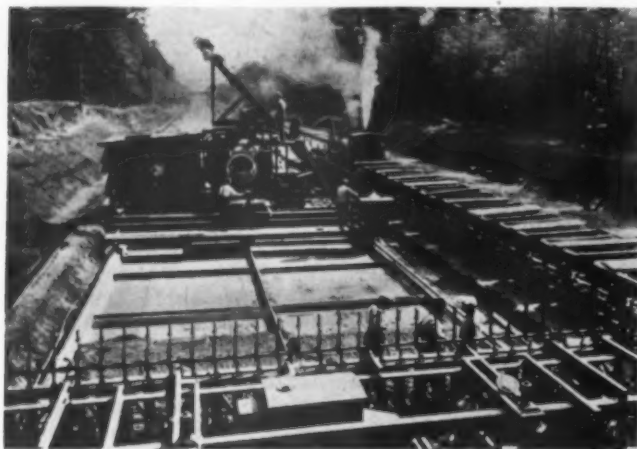


Industrial Railway Used in Grade Construction.



Industrial Railway Dumping Into Paver Skip.

Fill Construction—In building a fill with the industrial railway, the tracks must follow each lift or be moved back and forth across the grade as it is brought up. Because of the work required to do this, the fills are brought up in about thirty-inch lifts and this has presented some compaction problems. A power shovel with the dipper and sticks removed and a large flat weight, weighing in some cases two to three tons, attached to the hoist line, was one of the first pieces of equipment used to compact these heavy lifts. This weight was picked up and dropped, something like a skull cracker, as the shovel moved about over the fill. This would do good work on some materials but on others it had very little effect. Some special tamping machines, which were very heavy and mounted on crawlers for moving about over the work, were tried, but without much better results, while



Mixing, Spreading, and Finishing Equipment for Concrete Pavement. Note Side Loading of Mixer Skip and Heavy Rails Upon Which Machinery Operates.

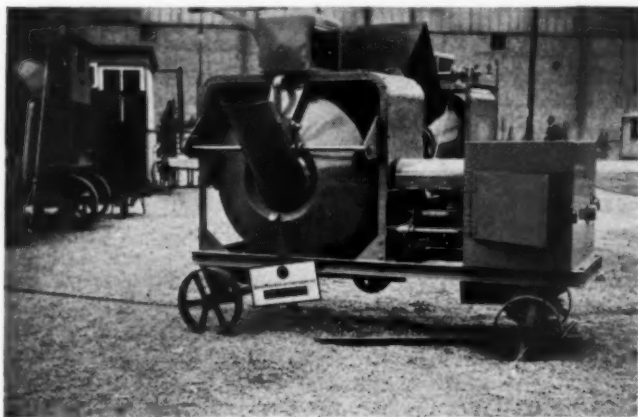
it is doubtful if it would have any particular effect on some materials in 30-inch lifts, the equipment which seems to have come into the most general use is referred to as the "Delmag-Frosch."

The "Delmag-Frosch" is a self-contained power tamper operated by internal combustion cylinder. It is about 34 inches in diameter at the bottom and 24 inches at the top; stands about 40 inches high and weighs about 2000 pounds. The ignition of the charge in the cylinder is caused by a battery and coils carried on the back of the operator and is controlled by a thumb switch on a handle bar. This causes it to jump off the ground about a foot each time and as the bottom, or tamper, part is made so

that the cylinder and main body leans ahead or away from the operator, it moves in that direction each time the charge is ignited by closing the switch on the handles. As this is repeated, the machine moves about over the work. The operator follows and guides it by turning it so the cylinder and main part of the body lean in the direction he wishes it to go.

This same idea of internal combustion cylinders is also applied to hammers for driving piling and the like. Some use the diesel principle and others low compression and electrical ignition. These hammers no doubt have some advantages, but it would seem that there must be considerable more development before it takes the place of the old steam hammer.

Pavers—The paver generally is much different than those used here and like all of the other equipment used with it, operates on the forms. The skip comes down to the side to take the material from the industrial railway.



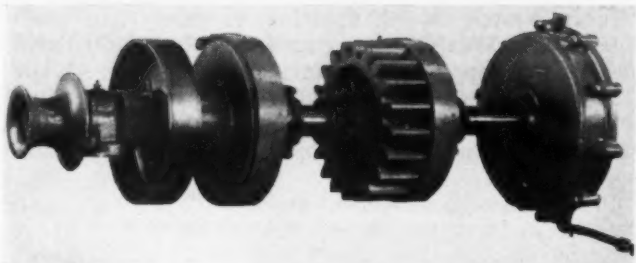
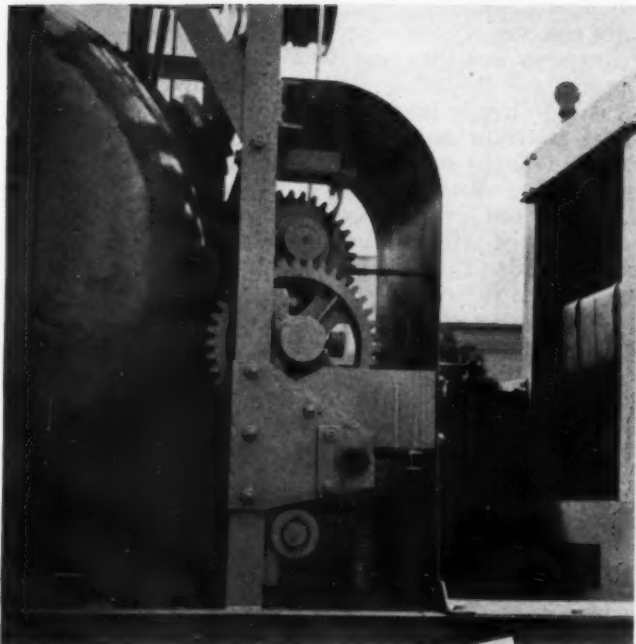
Small Concrete Mixer Shown at Leipzig Fair. Diesel Powered.

The batches are larger, usually one car at a time, which in some cases is as much as two cubic meters or 70.6 cubic feet. Both the drum and double pug-mill type mixing is used. The latter seems to have been the latest development and with the thought of drier mixes. Most of the machines are much heavier than those used here.

Instead of using a boom bucket for taking the concrete, the batch is taken from the mixer in a hopper-like car, carried on a traveler similar to a traveling crane, which is also operated on the forms. The concrete is spread on the grade in the proper thickness through a clamshell like opening in the bottom of this hopper as it is moved back and forth along the traveler. In some cases this traveler is a part of the mixer frame, which means that the mixer must be moved along the forms to



Mixing Concrete for Street Repair in Berlin. This Mixer Is Diesel Powered, Runs One Way to Mix and the Opposite to Discharge. Note Cement in Paper Bags.



Note Heavy Gearing on Drum Drive and Skip Hoist on Mixer at Leipzig Fair. Compare This With Following Picture of Shaft on American Machine Where All This Is Assembled on One Shaft Mounted on Anti-Friction Bearings.

bring the spreading hopper into the proper position as it is moved laterally.

Finishers—Finishing machines have been developed by several different companies and these are of many different types, all of which are much heavier than those used here. They all have a screed in front but this may be followed by several different types of tamping or vibrating devices. In some cases these are heavy tampers spaced and mounted in such a way that



Plant for Hot Bituminous Mixture. Dryer in the Background With Conveyors Leading to the Two Hot Mixers. Note Hot Wagons Lined Up for Transporting the Hot Mix.

they can move back and forth and each take half the slab. In others, there is a series of tampers mounted close together and extending the full width of the slab. In some cases this line of tampers is on a diagonal across the slab. A big heavy vibrating pan extending the full width of the slab and carried on a heavy "I" beam, mounted at either end in leaf springs, is also common.

The contractor must provide some sort of shelter just back of the finishing machine for the hand finishing, and this must be followed by enough low shelter to cover the pavement for 24 hours after it has been laid. In most cases both the shelter for the hand finishing and that for the slab are made of corrugated sheet iron on a light framework, mounted on wheels, which also moves along the forms. After 24 hours the slab is covered with reed mats and sprinkled about the same as is common practice here.

Forms—Naturally, to carry the heavy equipment, the form requirements are very much different than is common with us. A large part of the design for concrete slab calls for a narrow shoulder of bituminous material two inches thick on a six-inch concrete base. It is general practice to place this base before the main slab is poured and in this case the forms are little more than 70-pound rail, bolted to the base. If the bituminous shoulder is not to be used or if the base has not been laid, the forms used are very much similar to those used here, but very much heavier and have the 70-pound rail incorporated in them. In some cases, for grades,

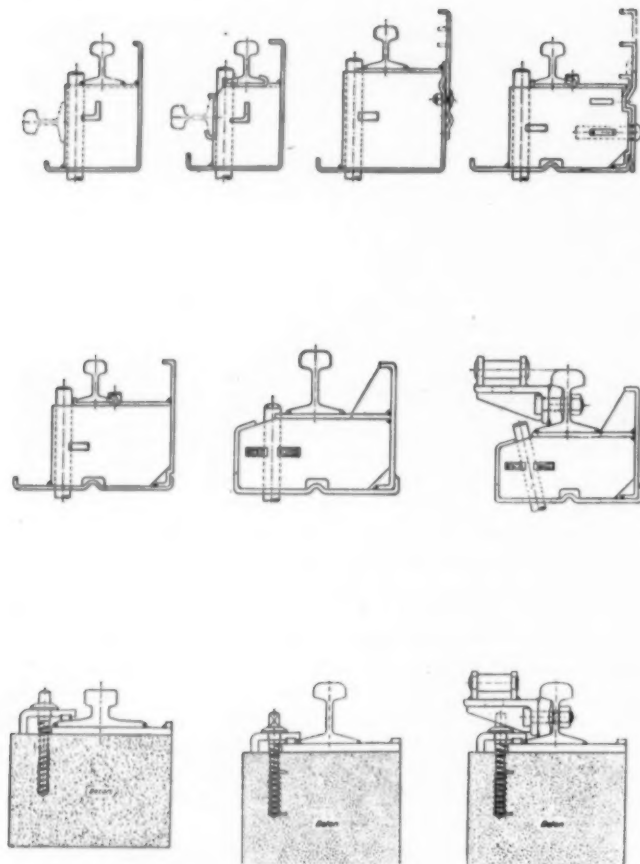


Spreading Black-Top Material on Streets in Berlin. The Hot Mix Is Placed on the Street From the Hot Transport Mixers With Small Buckets and Spread by Workmen Using Wooden Trowels Like Paddles.

there is a cog rack outside of this rail, which engages a gear on the paver. Often these forms are set in concrete and time allowed for setting before they are used. Heavy tongs like those used to handle railroad steel are used to handle the forms and at least eight men are required to handle a single section.

Paving Outfit—A German concrete paving outfit usually makes a rather long procession. First, may be the office of the inspector, or resident engineer, mounted on wheels and moved along the forms. Then comes a machine for laying the sand base. In order then comes a machine for laying the paper or subgrade felt, the paver, spreader and finishing machine, followed by the shelter for the hand finishing and long low shelter for the green slab. In cases where the slab is laid in two courses there are two pavers, two spreads and two finishers. One of these crews using one paver where the slab was being laid in one course reported 228 meters of 24 ft. 6 in., 8 in. thick in 10 hours.

Generally there seems to have been very little thought given to portability, as practically all of the equipment



Examples of Various Types of Forms Offered by One Large Steel Manufacturer. Note the Rail in All Cases and the Cog Rack on Two Types.

used on a concrete paving job must be completely dismantled when it is to be moved from one job to another.

The industrial railway has also had its influence on the batching plant. As there are times when a full train load must be taken out in a short time, there are usually several bins for the same size material, often ten or more bins to a single plant. In some cases the cars pass through under the bins and take the material directly from a batch hopper under each bin. In other cases the material is discharged from the batch hopper onto a belt and is carried out to the cars. The bins are charged both by cranes running on special tracks with clamshell buckets and by bucket elevators. In some cases there is a separate elevator for each bin. The cement comes in paper bags of about the same size and type as is common here. The proper number of bags are placed on each car and opened at the mixer.

Mixers—Fundamentally, most of the small German concrete mixers are similar to those used here, both the drum and tube type being common, however, there are a few of the drum type which run one way to mix and the opposite way to discharge, instead of using the discharge chute. Outside of being diesel operated, they would seem to compare in detail of design and choice of material with those manufactured here back in the early days of the small concrete mixer.

Bituminous Equipment—Most of the German portable bituminous surfacing equipment is much different than that common with us. This is no doubt due in part to the fact that because of the lack of petroleum and the use of residues from synthetic processes for the manufacture of liquid fuel, they must use a bitumen requiring much greater temperatures.

A plant usually consists of a small drier and two large auger mixers. These mixers are fitted with jackets and fireboxes so that they may be fired. There is no batch hopper above the mixer. The proper amount of material is fed directly into the mixer from the drier with a bucket conveyor and the bitumen added. While this material is being mixed in one mixer, the drier is used to charge the other mixer.

The mixture is taken from the mixer in wagons which are also fitted with jackets and fireboxes so that they may be fired. These wagons are also provided with an auger which is driven by a chain from the rear wheel for agitation and are usually hauled to where the material is to be used, by a small tractor.

At the back of this wagon is a small valve-like door from which the material is drawn into buckets and deposited on the base, where workmen with special wooden paddles smooth it down to the proper thickness. This surfacing on city streets or for the shoulder along the concrete slab is usually laid in two layers—the top being roughened while it is hot, to give a non-skid surface.

BLUE RIDGE PARKWAY HALF COMPLETED

The Blue Ridge Parkway connecting the Shenandoah National Park in Virginia with the Great Smoky National Park in western North Carolina, is nearly half completed, and indications are that it will be finished and opened to traffic in approximately three years. The Federal Bureau of Public Roads recently announced that as of January 1 this year work was underway or completed on 206 miles of the proposed 474 mile mountain-top boulevard.

Of the 246 miles in North Carolina, 116 miles are complete or under construction, and of the 228 miles in Virginia, 89 miles are complete or under construction.

Approximately \$16,000,000 has already been made available for the gigantic project, estimated to cost before completion in the neighborhood of \$30,000,000.

Work was begun with public works funds allotments amounting in all to approximately \$6,600,000. Last year regular appropriations of \$4,500,000 were made, and for the current fiscal year a total of \$5,500,000 was appropriated for the parkway in regular and deficiency bills.

Book Review

TRANSITION CURVES FOR HIGHWAYS, by Joseph Barnett, Senior Highway Design Engineer, U. S. Bureau of Public Roads. 211 pages, 4¼ in. by 7½ in., semi-flexible binding. Published by U. S. Government Printing Office. For sale by the Supt. of Documents, Washington, D. C. Price, 60 cents.

Transitions from tangents to horizontal curves have been universally adopted by railroads, but they have not been generally accepted for highways, even though their use results in greater safety, smoother riding, and a more graceful alignment of the highway.

Some of the reasons why this condition exists were valid when road speeds were slower than at present, but they do not apply now. In this book the relation of speed to highway design is discussed, and a method for determining the required lengths of transitions under various conditions is presented, together with tables from which the required transitions can be chosen and located without extensive calculations. Other factors related to transitions, such as limiting curvature, superelevation, pavement widening, and right-of-way acquisition, are discussed. The use of the tables should make it as simple and inexpensive to design and locate curves with transitions as it is to design and locate simple curves. The methods employed and the use of the tables are illustrated by numerous examples.

Some Notes On

BRIDGE CURBS AND RAILS

By E. B. VAN de GREYN

Bridge Engineer, New Mexico State Highway Department.

STATE highway department bridge engineers can usually tell about what year a bridge was built by the curb and railing on it. Changes occur in bridge rail design as time goes on, more data are collected and more thought put into the subject. The following thoughts are in the writer's mind, the pictures and sketches here-with are used to illustrate ideas.

When approaching or driving across a bridge the motorist should have a feeling of security. This feeling of security makes him a safer and more reliable driver, less likely to get into trouble. A substantial rail and ample width of roadway for passing approaching cars will provide this. A motorist will in any case naturally try to keep his car some distance away, say about two feet, from a rail or post as he cannot well gauge the distance from the right side of his car to an obstruction. Therefore, posts and rails set well back from the curb result in the motorist driving closer



Fig. 1.—On Left Old Type Truss, 16 ft. Roadway, 5½ in. Width Wooden Wheel-guard, Lattice Type Fence Fastened to Truss Members. Compression Member of One of These Spans Was Struck by Truck, Crippling and Nearly Causing Failure of Truss. On Right, New Bridge to Replace Old Bridge in Year 1928. New Bridge has 6 ft. 6 in. Walk With 9½ in. High Curb From Roadway Gutter and 18 in. High Curb on Right Side of Roadway With Face of Posts Set Back 7 in. From Face of Curb. Rails or Posts Have Not Been Damaged by Vehicles But Face of High Curb Has Many Scratches From Fenders, Etcetera, Coming in Contact With Curb Face.

to the curb, which really provides more effective width of roadway. Use of stepped curbs, wide top curb, foot paths or sidewalks results in posts and rails being further back from the curb. Especially where posts and rails are close to the curb face the posts should not project beyond the rail face and the rail should provide continuously smooth surface for contact with a vehicle. Preferably the rail should be continuous and the roadway face be offset in front of the posts.

The height of a single curb or of a lower curb of a stepped design should be sufficient to prevent a vehicle from climbing onto it. This is necessary in order to prevent damage of a vehicle, rail, through girders, or to truss members of through truss bridges. There have been many cases of through truss bridges being crippled



Fig. 2.—Single Curb With Two Rails. Roadway Width 20 ft.; Height of Curb Above Gutter, 10 in.; Top of Rail 3 ft. 7 in. Above Gutter; Face of Posts Set Back 8¼ in. From Face of Curb. Several of These Type Bridges Built and a Few Instances of Vehicles Damaging Posts or Rails. This Type Not Being Built Any More in New Mexico.

or destroyed through vehicles striking truss members.

The proper height of the top of a rail above the roadway or walk is a subject of much argument. The writer considers that height of rails should not be fixed for all cases but depends on horizontal widths of curbs and on width of top rail, and whether rails adjoin the roadway or are at the outside of the sidewalk. For bridges in rural sections where very little pedestrian traffic is found or expected the practice has been to make no provision for pedestrians, but in some states it has or is becoming practice to provide foot paths on bridges by means of a widened curb top. It is anticipated that pedestrians will generally, on such rural bridges, not use foot paths except when they think they will be crowded by vehicles. Due to such infrequent use it is thought that the height of rail above the foot path might



Fig. 3.—Overpass With 24 ft. Roadway Between Lower Steps of Stepped Curbs. Height of Lower Curb, 11½ in. Above Gutter, and Top of Top Step, 2 ft. 0 in. Above Gutter. Face of Posts 1 ft. 3½ in. From Face of Lower Curb. No Damage to Posts or Rails From Vehicles. Height of Top of Rail Above Gutter 3 ft. 2½ in. Many Bridges With This Type of Curb and Rail Have Been Built.

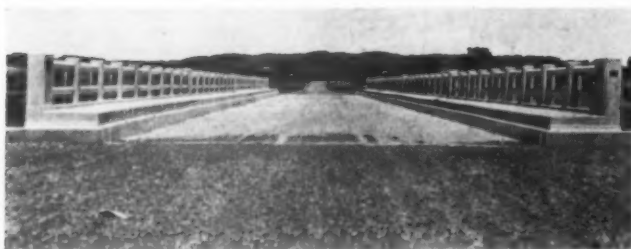


Fig. 4.—Stepped Curb With Walk at Level of Top Step. Roadway 24 ft. Between Bottom Curbs. Top of Lower Curb, 11½ in. Above Gutter; Walk 1 ft. 8½ in. Above Gutter; Walk 3 ft. Wide; Top of Rail 3 ft. 0 in. Above Walk. Unfavorable Feature Is Height of Rail Above Gutter From Motorist's Standpoint and Necessity of Pedestrian to Step Up Two Steps to Get Onto Walk. Better Arrangement for Walk Is Shown in Fig. 5. Appearance Might Be Improved if Sloping End Posts Were Introduced on Abutments, Providing a Gradual Reduction in Height at Ends of Bridge.

be reduced from that needed above a walk carrying pedestrian traffic. In order to have some heights to work from, for purpose of discussion, let a height be assumed for top of rail, of 2 ft. 4 in. above the foot



Fig. 5.—Viaduct in Albuquerque, N. M. Forty-Foot Roadway With 6 ft. Sidewalk Each Side, Height of Curb, Height From Gutter to Walk, 12 in. Top Rail 3 in. Diameter Pipe, With Top of Rail 3 ft. 3½ in. Above Walk. Spindels Are ¾ in. Square Rods 4 in. Center to Center, Allowing View of Countryside as Can Be Seen From Picture.

path or above the gutter for bridges without foot paths. For sidewalks for regular pedestrian traffic, requiring more height for protection, assume a height from the walk to the top of the rail of 3 ft., minus one-half of



Fig. 6.—Six 165 ft. Spans Through-Truss Bridge. Roadway 24 ft. Between Lower Steps of Stepped Curbs. Top of Lower Curb 9 in. Above Gutter, and Top of Top Curb 1 ft. 6 in. Above Gutter. Continuous, Smooth Face, Plate Rail Connected to Truss Members. Face of Rail 1 ft. 2½ in. Back From Face of Lower Curb, Top of Rail 3 ft. 2 in. Above Gutter. Sidewalk 5 ft. Wide on One Side Outside of Trusses at Level of Top of Top Curb. Top of Sidewalk Rail 3 ft. 2 in. Above Walk. Spindels of Sidewalk Fence ¾ in. Square Bars 6 in. Centers. Rails on This Bridge Allow Good View for Motorist. Trusses Considered Pretty Well Protected by Stepped Curb and Distance From Lower Curb Face to Plate Rail; There Would Be Better Protection to Trusses if Walkways were Inside of Trusses.

the horizontal width of the top of the rail, with a minimum of 2 ft. 6 in. from the walk to the top of the rail.

From the standpoint of a motorist there is more pleasure in motoring if he can see through the bridge fence and over the top of the top rail. By seeing through the bridge fence is meant being able to see through at any angle in order to see the countryside. A concrete bridge fence with narrow vertical slot openings does not permit a view through to the country side except when the car is stopped so as to look through at right angles.

The thought in writing this article was that it might bring out comments from others and thus add facts and ideas of value.

The pictures presented with this article show some of the curbs and railings built in New Mexico.

Stepped curb design is used extensively in New Mexico. The idea is to have a lower curb of such height as to allow fenders, running boards, and axles to clear the top of the curb and still be high enough to prevent vehicles from climbing the curb, with the face of the top curb set back far enough to prevent fenders from riding against its face. The stepped curb is designed to take

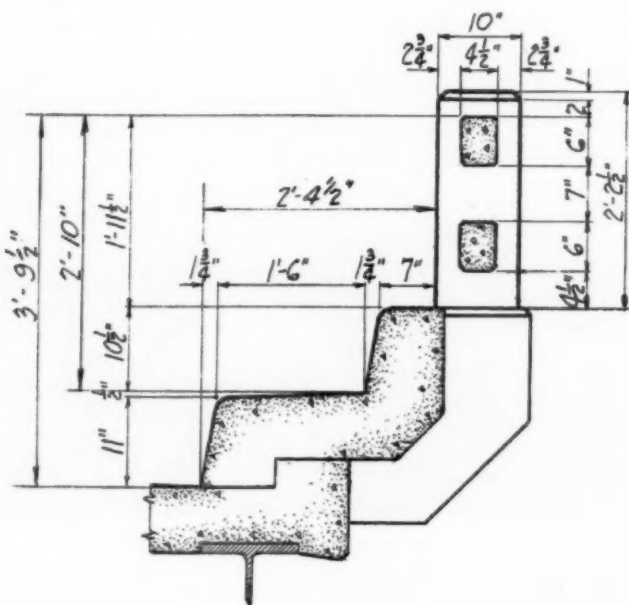


Fig. 7.—Showing Stepped Curb With 18 in. Wide Pathway With 2 Rails, Top of Top Rail Being 2 ft. 10 in. Above Pathway and 3 ft. 9½ in. Above Gutter. Proposed Where It Is Considered That Pathway May Be Frequently Used for Walk.

care of a horizontal load of 500 lb. per lin. ft. of curb, leaving the rail to carry the usual horizontal load of 150 lb. per lin. ft. and a vertical load of 100 lb. per lin. ft. The concrete roadway slab has about a half inch of concrete wearing surface cast monolithic with the structural slab and generally there is no additional wearing surface added, so the usual height of the bottom curb will be 11 inches. In case from 1 in. to 2 in. of bituminous wearing surface is added to the roadway slab it is not expected that a vehicle will climb this lower curb, the top of such a lower curb being 9 in. to 10 in. above the bituminous wearing surface.

Figures 7 and 8 show faces of rail posts 2 ft. 4½ in. back from the bottom of the bottom curb, which provides a greater width for pedestrians than indicated by the 1 ft. 6 in. foot path dimension. A person can walk close

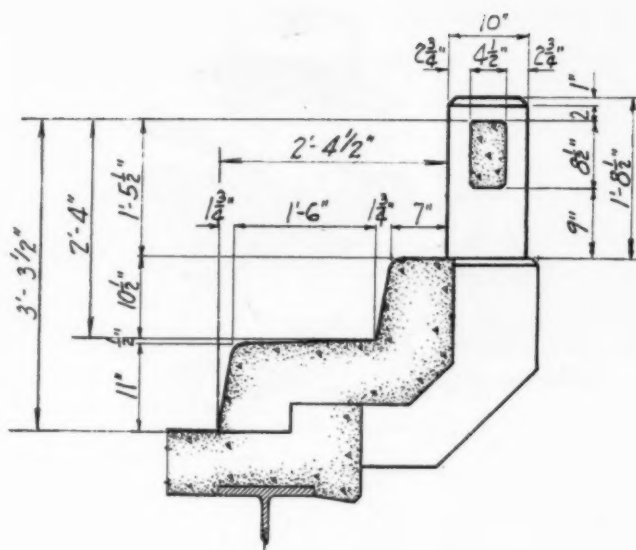


Fig. 8.—Showing Stepped Curb With 18 in. Wide Pathway With One Rail; Top of Rail 2 ft. 4 in. Above Pathway and 3 ft. 3½ in. Above Gutter. Proposed Where It Is Considered That Pathway Will Be Infrequently Used by Pedestrian.

to the upper curb, the 8¾ in. horizontal distance from the post to the intersection of the pathway with the curb provides arm room.

TOURISTS PAY FOR MINNESOTA ROADS

Minnesota's tourist business, which could not exist without good roads, pays enormous dividends on Minnesota's trunk highway investment. The state's tourist industry is variously estimated at having an annual value of from \$80,000,000 to \$125,000,000. Strangely enough, the \$80,000,000 figure is the estimate of the state's own tourist bureau, while the \$125,000,000-a-year valuation is the figure announced by the National Park Service in a bulletin just released. Since the origin of the state trunk highway system 18 years ago, the people of Minnesota have paid in motor vehicle license fees and gasoline taxes a total of \$252,000,000 for its improvement and maintenance.

A \$3,364,000 HIGHWAY LETTING IN MICHIGAN

Bids on 41 construction projects were opened recently by the State Highway Department, the total of the successful bidders being \$3,364,245. Competition at the letting, one of the largest ever held by the highway department, was unusually keen with totals running nearly \$600,000 under original estimates.

The bids include eight bridges and 285 miles of road improvements with the latter embracing 197.8 miles of oil aggregate surfacing, 55.4 miles of stabilized aggregate surfacing, 14.8 miles of grading and drainage, 9.4 miles of concrete pavement, and 8.4 miles of gravel surfacing.

Thirty of the 41 projects are on the department's new PWA program with Federal funds financing 45 per cent of the cost. The others are regular Federal Aid financed on a matched-fund basis. Construction on the PWA

projects will get under way within ten days after contracts are awarded.

PWA regulations do not follow the Michigan law of pre-qualifying contractors as to their financial and equipment ability to handle contracts they bid. Under the PWA system, the awarding authority must determine the ability of contractors to fulfill their contracts after bids have been opened.

OBSELETE BRIDGES ON INDIANA HIGHWAY

Surveys have shown that there are approximately 1,900 bridges on the present Indiana state highway system which have a roadway of 20 feet or less or a load carrying capacity too low for present traffic demands. It is estimated that the replacement of these obsolete structures would cost between twenty and twenty-two million dollars. Many of these bridges are so located that curves or sharp turns add to the hazards faced by motorists traveling the highways on which they are located. A majority of these obsolete bridges were constructed by counties and townships prior to the establishment of the state highway system, at a time when there were comparatively few automobiles and fewer trucks. These bridges were not designed to carry either the volume or the type of traffic which moves over the state highway system today.

SURVEY SHOWS DUAL HIGHWAY IS SAFEST

Studies conducted by the traffic engineer of the Indiana State Highway Commission show the dual lane highway has the lowest percentage of accidents per million vehicular miles traveled. According to the survey, Indiana has an average of 1.72 accidents per million vehicular miles on dual-lane highways; 2.55 accidents to the million vehicular miles on four-lane undivided roads; 2.75 accidents per million vehicular miles on three-lane highways, and 2.53 accidents per million vehicular miles of travel on two-lane highways.

Seeking to build the greatest possible safety into the state highway system, the State Highway Commission is extending the mileage of dual-lane roads in heavily congested areas as rapidly as funds will permit and is conducting tests in methods of transforming four-lane highways into dual lane routes. Use of several types of lane separators is being tested on Road 31 between South Bend and the Indiana-Michigan line, while a low, rounded curb has been installed on the rebuilt section of Road 40 between Indianapolis and Cumberland.

Projects for the completion of dual-lane construction on Road 30 in Porter County, and on Road 40 in Vigo and Clay counties are a part of the Commission's 1939 program.

PROGRESS ON PAN AMERICAN HIGHWAY IN PERU.—The total length of the Pan American Highway in Peru is 3,227 kilometers. All of this road is passable, and its improvement is being performed at a steady rate, with some 700 kilometers already asphalted and plans prepared to improve the remainder in similar style. By the end of 1940 it seems quite certain that 1,400 kilometers or 840 miles will be completely improved and the remainder sufficiently perfected to permit comfortable travel at all periods of the year.

OBSERVATIONS

BY THE WAY

By
A. PUDDLE JUMPER



☞ Do you realize that not so many years ago some communities laid in supplies for the long winter months in preparation for the isolation that was to be theirs because of snow and mud blocked roads? Now year-round travel is not even a topic of speculation. It is merely assumed.

☞ Do you realize that "readiness to serve" is an element of highway value upon which we generally fail to capitalize? It is a powerful reason why gas taxes and motor vehicle license fees should be reserved for highway construction and maintenance.

☞ In Oklahoma, last December, on the way to Texas, I passed this mud pump crew which had just stopped to raise the slab approaches to the



bridge. What struck me was the completeness of the outfit and the evidence of Oklahoma's desire to "Maintain Such as to Invite Traffic."

☞ Typical Texas marker used on highways near points of historical interest. These were provided by a



Texas women's organization. The plates are difficult to see from a car and consequently few people stop to read the markers.

☞ Attention! A. Puddle Jumper: "I noticed that you were desirous of finding the name of the author of the poem 'The Engineer' which you published in your February, 1939, issue.

"I can be of very little help, but if the information will be of any value to you, this poem was printed in the September, 1928, issue of the New Mexico Highway Journal (now 'New Mexico' a state magazine) with the credit 'Anonymous, contributed by J. A. Boulton.' The last I knew of Mr. Boulton he was in Ohio. I have heard that he died several years ago, but am not certain that the J. A. Boulton who died was the one who was formerly an employee of the New Mexico State Highway Department
J. J. HARDING,
415 Paloma St.,
Santa Fe, New Mexico."

☞ J. Q. Barlow, The Utah Construction Company, San Francisco, Calif., writes:

"On Page 44 of your February issue, you have quoted a poem entitled 'The Engineer' and asked if some one could give you the author.

"This poem is very old. I have had a typewritten copy in my possession for possibly forty years. It is supposed to have been written by 'W. C. Kidd.' Something like 48 or 50 years ago, I was acquainted with Kidd, when he was an instrument man on one of our parties, engaged in preliminary and location surveys for the Union Pacific Railroad."

☞ This is interesting. It is to bad

that we have lost the identity of the author of the poem.

☞ Herewith a view of what I think is the ideal two lane roadbed. It is a 20 ft. pavement, flanked on the sides by 18 in. of bituminous mix and about 4 ft. of stabilized soil. It is U. S. 67 just east of Mt. Pleas-



ant, Texas. The cross section, roadside development, aluminum painted guard rail, and reflectionized posts create the ideal roadway.

☞ One of the bad traffic hazards we've seen is that in Cleveland, on U. S. 2, 6, and 20, where Lake Avenue intersects Edgewater Drive. A fellow just simply courts a head-on



collision, since there is neither a stop sign or a traffic light at this point. Wonder why something isn't done about this? A cleverly-worded billboard isn't the answer!

HIGHWAYS OF HISTORY



1539—HORSES BROUGHT TO NEW WORLD

¶ Spaniards introduced the forefathers of the modern horse. The explorer Hernando de Soto probably brought over the first horses that had set foot on the soil of the present United States when he landed his favorite mount Aceituno from a caravel.



1760—TOBACCO-ROLLING ROAD

¶ Tobacco was the money crop of Colonial America. Southern planters rolled hogsheads filled with the precious weed from field warehouses over tobacco-rolling roads to the river landings for shipment to the English mother country. The rope in the hands of the negro was used as a brake.



1774—WILDERNESS ROAD

¶ For 150 years the British settlements in America were confined to a strip of land 150 miles wide along the Atlantic seaboard. Then just before the Revolutionary War Daniel Boone began the westward movement over the Wilderness Road through the Cumberland Gap across the Allegheny Mountains.



1607—CANOES THE FAVORITE VEHICLE

¶ When Captain John Smith met the great chief Powhatan at his Indian village on the James River downstream from what is now Richmond, Virginia, the Atlantic Ocean and its tributary streams formed the main highways of America and canoes dug out of charred logs were the favorite vehicles of the first families.



1763—BOSTON POST ROAD

¶ Meanwhile in New England, on the Boston Post Road from New York, Postmaster General Benjamin Franklin, riding in a one-horse shay accompanied by his daughter on horseback, made a tour of inspection of the Colonial post offices. A tireless post rider delivered his chief an urgent letter along the way.



1795—PHILADELPHIA-LANCASTER PIKE

¶ Chaotic economic conditions following the American Revolution delayed the beginning of organized road improvements. In 1795 a privately-owned toll company finished the first extensive broken-stone surface in this country on the sixty-two-mile Philadelphia-Lancaster Pike.



1679—NIAGARA FALLS PORTAGE-LA SALLE

¶ Seventy years rolled by. French explorers in search of a direct route to China traveled overland from one river to another. Here stand Robert Cavalier Sieur de La Salle and his bosom companion Franciscan Father Membre on the portage path around Niagara Falls on their way to the Mississippi River.



1766—NEW YORK-PHILADELPHIA ROAD

¶ The Flying Machine was the first attempt at rapid transportation in the British Colonies in North America. Two days of hard driving were required to cover the ninety-mile distance from Philadelphia to the Paulus Hook Ferry, now Jersey City. The stage made the trip twice a week.



1809—NATCHEZ TRACE

¶ Just before the Louisiana Purchase, Congress ordered opening of the Natchez Trace from Nashville, Tennessee to Natchez on the Mississippi. Over this path flatboatmen traveled homeward after floating their laden craft down the Ohio and Mississippi to New Orleans; and here at Griner's Tavern Governor Meriwether Lewis of Louisiana lost his life in 1809.

"Highways of Tomorrow"

Civic Auditorium

San Francisco, California

March 7-10, 1939

American Road

WASHINGTON, D. C.

CONSTRUCTION CONGRESS WEEK TO

Down the Road

By CHARLES M. UPHAM

Engineer-Director,

American Road Builders' Association, Washington, D. C.

CONSTRUCTION CONGRESS TO BE HELD AT SAN FRANCISCO

The seventh of March will be American Road Builders' Association Day at the Golden Gate International Exposition in San Francisco. On this day also will open the 36th annual Convention and Highway Exhibit of the ARBA in the Golden Gate City. Twenty thousand road builders from the forty-eight states and twenty-five foreign countries are expected to be on hand to visit exhibit booths and attend convention sessions.

Other groups meeting concurrently with the ARBA will also have their day at the Exposition. March 5 has been designated as Associated Equipment Distributors Day; March 6, Construction Congress Day; March 8, Associated General Contractors of America Day; March 9, Highway Engineers and Officials Day, and March 10, County and Municipal Day.

The Western Association of State Highway Officials, which will also hold its annual meeting in San Francisco during the week of March 5, will meet in a joint session with the ARBA. A joint session of the County Supervisors' Association of California and the County Officials' Division of the American Road Builders' Association has also been arranged by J. C. McLean, president of the ARBA county group and Stanley Abel, secretary of the County Supervisors' organization. The League of California Municipalities plans to participate in the sessions of the ARBA Municipal Division and a highly interesting and important program has been scheduled for city officials and engineers by George C. Stanley, division president.

SHERLOCK NAMED PRESIDENT ALABAMA ROAD DEPARTMENT

C. J. Sherlock, a member of the ARBA Board of Directors, has been appointed president of the Alabama State Highway Department. He was formerly first assistant engineer of the department and succeeds Gaston Scott as president. Charles H. Purcell, former president of the American Association of State Highway Officials, has resigned his post as state highway engineer of California to accept the position of traffic engineer for the city of San Francisco. His resignation will become effective on March 15. His successor has not yet been named.

GOOD ROADS MAKE A GREAT METROPOLIS

Yesterday I stood atop Coit Tower, which shafts its way upward 185 feet above the crest of Telegraph Hill, and I looked out over the wide expanse of San Francisco Bay, fenced in by its fourteen hills. From Coit Tower one obtains possibly the best long-range view of San Francisco's metropolitan area. Telegraph Hill is 286 feet above the city and it was from this point that clipper ships were sighted in the early '40s and news of their arrival relayed to the city below. The tower was the bequest to the city of Lily Hitchcock Coit, picturesque belle of the '60s, whose hobby was going to fires. She was honorary member of the fire department, wore her medal on all her evening gowns and left many a fashionable gathering to go to a fire. She dearly loved San Francisco and willed a third of her fortune for the tower's construction.

As I looked out over San Francisco Bay, being a highway engineer, my interest was first of all consumed by the traffic distribution system of the world's longest bridge, the San Francisco-Oakland Bay Bridge, which carries 50,000 persons to and from work in San Francisco each day. I knew, as I gazed upon this wonder bridge, that I was witnessing the end of the isolation of a city, brought about by the construction of an "elevated highway" between San Francisco and the mainland. I was watching the tremendous flow of traffic that had been kept out of San Francisco prior to 1937 by five miles of water. I was witnessing the actual process of new life and new money being poured into an already great city. A few days ago I was presented with a set of figures that estimate a 10 to 20 per cent increase in gasoline consumption by delivery trucks since the additional traffic from the Bay bridge and the Golden Gate bridge "came to town."

As my eye roved over the shoreline traveling public,

past the old Presidio and the Golden Gate bridge, second wonder span built by a progressive city, to the heights above, where Uncle Sam keeps his coast defense guns guarded day and night, I realized that San Francisco will become a key point on the super-highway that will eventually link Alaska to the Panama Canal. Such a super-road will be of inestimable peacetime benefit to the peoples who live along its route, but it will also serve as a vitally important military defense highway for the rapid transportation of mechanized army units in the event of invasion from across the Pacific.

Then I looked farther out and beyond the shores of San Francisco Bay and I saw the white ribbons of U. S. Routes 101, 40, 50 and a branch of 99, the lifelines of a great city, bringing buses, trucks and automobiles into the metropolis of the Pacific. I knew that in those buses and automobiles people were coming to San Francisco with new ambitions for the future. I knew that the trucks were transporting lumber, apples, pears, cotton, asparagus, artichokes, oranges, olives, figs, peaches, celery, rice, cattle, sheep, hogs, alfalfa, prunes, grapes, apricots, wine, oil, gold, quicksilver from the city's vast hinterland of eleven Western states to San Francisco for transshipment to the rest of the country and to many parts of the world.

As I turned to leave, I realized that I had just witnessed the greatest possible justification for "Highways of Tomorrow," the theme of the 36th Annual Convention and Highway Exhibit of the American Road Builders' Association, which will, during the four days of March 7-10, "teach" 20,000 road builders from the forty-eight states and twenty-five foreign countries how to build and maintain the highways of the future. The highways of tomorrow can and must be safe highways for the full-time use of America's

Builders' Review

MARCH, 1939

36th Annual Convention-Highway Exhibit
American Road Builders' Association
in San Francisco's Civic Auditorium
March 7-10, 1939

OPEN IN SAN FRANCISCO MARCH 5

With Our State Groups

FLORIDA

The annual business meeting of the Florida Section of the American Road Builders' Association was held in Tallahassee, February 15. Distinguished guests invited to attend the luncheon at the Floridan Hotel the following day included Governor Cone of Florida, his secretary, the chairman and members of the state road department in Tallahassee, including division engineers; the incoming president of the Florida Senate and the speaker-elect of the Florida House of Representatives. H. M. Birtley, secretary of the Florida group, was in charge of arrangements for the meeting.

NORTH DAKOTA

Milton Rue of Bismarck, N. D., has succeeded Miss Mary Nierling of Jamestown as president of the North Dakota Highway Contractors' Association. Other officers elected for the coming year at the recent annual session at Jamestown include George Haggart of Fargo, vice-president, and J. A. Jardine of Fargo, Leo Collins of Bismarck and Miss Nierling, directors. Holdover directors are Carl Lindberg, Jamestown, and Archie Campbell, Warwick. Miss Nierling was toastmistress at the annual banquet. Z. E. Severson, state highway engineer, and N. W. Hicks, construction engineer, were speakers.

UPHAM IS SPEAKER AT KENTUCKY ROAD MEET

Charles M. Upham, engineer-director of the American Road Builders' Association, addressed the banquet-meeting of the Kentucky Association of Highway Contractors at the latter group's eighteenth annual convention in Louisville on February 18. Thomas R. Underwood, editor of the Lexington Herald, acted as toastmaster at the banquet and C. H. Wood, president of the organization, presided.



NEARLY one thousand persons attended the Sixth Annual Banquet of the Colorado Association of Highway Contractors, Inc., an ARBA affiliate, in the banquet hall of the Shirley-Savoy hotel in Denver. Speakers included Charles M. Upham, ARBA engineer-director; Charles A. Switzer, association president elect; Charles D. Vail, state highway engineer; Colorado Governor Ralph W. Carr; B. W. Matteson, district engineer, U. S. Bureau of Public Roads; Denver Mayor B. F. Stapleton; C. F. Seifried, superintendent-engineer, state of Wyoming. Edward H. Honnen, 1938 president, was toastmaster.

SOUTH DAKOTA

Resistance to any attempts to divert proceeds of the gas tax to other uses than highway construction and maintenance was one of the principal points on the 1938 program of the Greater South Dakota Association at Huron. This group, which was formed less than three years ago, co-operated with other groups in 1937 in bringing about the repeal of the state law diverting this tax to non-highway purposes. The organization recently assisted the state highway commission in the preparation of a promotion booklet featuring all parts of the state to promote tourist business.

James E. Maloney, senior highway engineer, Colorado State Highway Department, who recently retired after 28 years of service with the department, was secretary of the state's first highway organization, which was established in 1910.

Orrin M. James

Orrin M. James, president of the New Hampshire Good Roads Association, who died recently from a heart attack in Chattanooga, Tenn., was 70 years old and had been a division engineer of the New Hampshire State Highway Department for the past thirty-two years. Born in Northwood, N. H., on March 19, 1868, he was graduated from the state college with the degree of B.S. in 1893. He joined the state highway department in 1906. He was elected to the presidency of the New Hampshire Good Roads Association at its last annual meeting. Mr. James was also active in the National Grange and was returning from its annual sessions in Portland, Ore., when he was stricken.

NEW PRACTICAL TEST PROCEDURE

on

EMULSIFIED ASPHALT FOR SOIL STABILIZATION

By R. R. THURSTON¹
BRUCE WEETMAN²

CONSIDERABLE information has been published regarding soil stabilization with emulsified asphalts, asphaltic SC and MC materials, salts, coal tar, cement, etc. Additional information regarding the use of emulsified asphalt for this purpose is necessary to guide those engaged in this type of construction. Various factors affecting the results obtainable by stabilization of soils with emulsified asphalt will, therefore, be discussed in this article.

Emulsified asphalt is a particularly useful stabilizing material for soils, due to

- 1.—The ease with which it mixes with all types of soils.
- 2.—The stability that can be obtained, and
- 3.—The water repellent characteristics of the mixture after drying.

Method of Preparing and Examining Soil-Emulsion Mixtures—In order to determine the proper amount of emulsified asphalt which should be used to stabilize a given soil, a simple and inexpensive apparatus (shown in figure 1) and a short procedure have been developed. Results can be obtained in a few days and the apparatus may be built in any shop. The stabilized soil is molded into briquets one inch thick and four inches in diameter, compressed, dried, subjected to a water absorption test for 24 hrs., and then tested for stability. Longer periods of exposure to water absorption can also be used in order to obtain additional information.

This method consists briefly of the following:

The liquid limit is determined on the soil under investigation and an equivalent amount of water and emulsion is added with thorough mixing. The amount of emulsion is calculated from the percentage of asphalt desired to be incorporated and the water is determined by difference. The mixture is troweled into circular wooden forms 4.0 in. in diameter and 1.125 in. deep. This provides for a briquet having a thickness of close to one inch, after compaction and drying. These briquets are allowed to cure under a moist cloth for 24 hrs., after which they are compacted for five minutes under a total load of 300 pounds. They are then allowed to dry for 24 hrs. under room conditions and placed in an oven at 160 deg. F., until they reach constant weight. The specimens are then weighed and placed on a blotting paper, saturated with water, for 24 hrs. or longer, reweighed and the water absorbed calculated.

The strength of the briquet is then determined on a compression machine, which is a simple lever arrangement (see figure 1). The lever arm is a 74-in. length of 2.0 in. by 0.5 in. steel bar. It pivots on fulcrum "A," carries two compression points ("B" and "C") located one foot and three feet from "A," respectively, and has a shot bucket suspended at "D," six feet from "A." At the fulcrum the lever arm is supported by a 0.5 in. steel rod running diametrically through a length of three inch extra heavy steel tubing. An alignment guide "E," is located at the free end of the lever. This assembly is bolted to a wooden base.

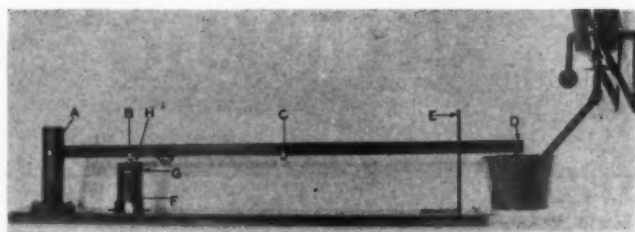


Fig. 1.—Compression Testing Apparatus.

The briquet and load supporting assembly consists of three parts—a six inch length of four inch (OD) steel tubing, "F," a four inch diameter annular ring, "G," and a circular steel disc, "H," of one square inch area (1.128 inch diameter). The diameter of the opening in the top of the annular ring is 1.437 in.

In the compression test the briquet is placed on the annular ring, the moist side up, and the steel disc placed on it in a concentric position. This assembly is placed under one of the compression points and lead shot run into the bucket from an overhead supply at a rate of ten pounds per minute, until the core is pushed from the briquet and failure occurs. This is not a true compression test, but the calculation of strength in lb. per sq. in. is made by multiplying the weight of the shot bucket and shot by the length of the lever arm, dividing by the distance from the fulcrum to the compression point, ("B" or "C") and adding the effective weight of the lever at that point.

Soil Characteristics vs. Stabilization—In the classification of soils it must be realized that there can be no sharp limitation separating one type from another, but that there is a gradual transition from the very sandy to the very clayey types. Soil constituents, defined according to particle size, generally are classified into groups. These groupings may be found in the literature on the subject and in the A. A. S. H. O. standard tests.

A particle size analysis showing the percentage by weight of each of the various classes of material aids in predicting the behavior of a soil. Additional valuable information can be obtained from physical characteristics such as the liquid limit, the plastic limit, plasticity index, and other tests. [These tests have been published many times and are fairly well standardized now.—Ed.]

The plasticity index is indicative of the composition of the soil, and high indices generally indicate high clay and colloid contents.

A microscopical examination of dried emulsified asphalt stabilized soil mixtures, shows that the stabilizing of soils containing over approximately 30 per cent of material finer than 200-mesh results from a uniform distribution of countless small particles of asphalt throughout the soil. These block a sufficient percentage of the interstices between the soil particles to prevent

¹Tech. & Research Div., The Texas Company, New York, N. Y.

²Tech. & Research Div., The Texas Company, Beacon, N. Y.

water absorption by capillarity, and thereby preserve stability. In the more sandy soils, stabilization is usually obtained by actually coating the aggregate particles with a continuous asphalt film. The type of mixture obtained is dependent upon the size of the soil particles and the percentage of asphalt incorporated in the mix.

Sieve analyses, liquid and plastic limits and soil stabilization data on five different soils received from widely scattered locations are shown in Table I. These soils

TABLE I
STABILIZATION DATA FOR SOILS OF VARYING
PLASTICITY INDICES

Test on Soils:	No. 1	No. 2	No. 3	No. 4	No. 5
Sieve Analysis					
Retained on 10 Mesh....	6.6	6.1	9.4	0.0	5.1
Thru 10 on 20 Mesh....	4.0	6.8	14.6	0.0	5.6
20 on 30 Mesh....	2.4	3.3	6.3	0.0	3.7
30 on 40 Mesh....	3.4	3.8	6.7	0.0	6.4
40 on 50 Mesh....	3.4	3.6	5.8	0.9	8.9
50 on 80 Mesh....	4.8	6.1	7.2	36.8	14.8
80 on 100 Mesh....	1.4	3.5	3.6	24.2	7.2
100 on 200 Mesh....	2.8	7.2	5.1	19.5	8.2
200 on Pan.....	71.2	59.6	41.0	17.2	40.1
Total.....	100.0	100.0	99.8	98.6	100.0
Liquid Limit	41.1	35.7	25.6	23.2	31.2
Plastic Limit	23.6	23.7	18.6	19.4	unobtainable
Plasticity Index	17.5	12.0	7.0	3.8	0
Tests on Emulsion:					
Viscosity, Furol, 77° F.			27		
Residue from Distillation, %.....			58.0		
Penetration, 77° F.			156		
Sieve Test, %.....			.02		
Cement Mixing Test			0.5		
Demulsibility Test, 50 cc. N/10 CaCl ₂			0.0		
Tests on Dried Briquets:					
Asphalt, % (Basis Dry Soil)	4.0	4.0	4.0	4.0	4.0
Weight, Grams	396	330	385	334	355
Thickness, Inches	1.04	1.00	1.03	1.02	1.14
Water Absorption, %....	0.95	1.88	1.12	4.6	1.51
Compression Strength, (lb./sq. inch)	294	168	275	200	169

TABLE II
EFFECT OF SOIL CONSTITUENTS ON STABILIZED
STRENGTH

Tests on Soils:	No. 3	No. 2	No. 6
Sieve Analysis			
Thru 1/4 on 1/10.....	9.4	6.1	5.1
1/10 on 1/20.....	14.6	6.8	14.0
1/20 on 1/30.....	6.3	3.3	6.2
1/30 on 1/40.....	6.7	3.8	6.6
1/40 on 1/50.....	5.8	3.6	5.7
1/50 on 1/80.....	7.2	6.1	7.2
1/80 on 1/100.....	3.6	3.5	3.2
1/100 on 1/200.....	5.1	7.2	4.8
1/200 on Pan.....	41.0	59.6	47.0
Material Coarser Than 2.0 mm.....	9.5	6.5	2.5
Coarse Sand, 2.0-0.5 mm.....	36.8	15.5	27.5
Fine Sand, 0.5-0.05 mm.....	15.7	22.5	13.0
Silt, 0.05-0.005 mm.....	23.8	42.5	32.7
Clay, 0.005-0.001 mm.....	7.2	5.5	11.3
Colloids, Finer Than 0.001 mm.....	7.0	7.5	13.0
Liquid Limit	25.6	35.7	26.4
Plastic Limit	18.6	23.7	18.5
Plasticity Index	7.0	12.0	7.9
Tests on Emulsion:			
Viscosity, Furol, 77° F.	27		
Residue from Distillation, %.....	58.0		
Penetration, 77° F.	156		
Sieve Test, %.....	.02		
Cement Mixing Test	0.5		
Demulsibility Test, 50 cc. N/10 CaCl ₂	0.0		
Tests on Dried Briquets:			
Asphalt, %	4.0	4.0	4.0
Weight, gms.	385	330	392
Thickness, inches	1.03	1.00	1.08
Water Absorption, %	1.12	1.88	1.0
Compression Strength (lb./sq. inch)	275	168	504

were selected to show variations in plasticity indices, and were stabilized and tested in accordance with the procedure outlined. Sufficient emulsified asphalt was used so that the dried briquets contained four percent asphalt. A typical soil mixing emulsion having a distillation residue of 156 penetration was used in each case. Examination of these data indicates that there is no definite relationship between the amount of fines passing the 200 mesh sieve or the plasticity index of these soils and the strength of the stabilized mixtures, when maintaining the asphalt content at four percent.

The effect of variations in particle size of the material passing a 200-mesh sieve on the strength obtained after stabilization is shown in Table II. The soils used in these tests were obtained from one general location, and were stabilized with the same emulsion. The tests show that compression tests on the stabilized soils are independent of the soil constants, but dependent on the percentage of clay and colloids present. Soil No. 6, containing a combined clay and colloid content of 24.3 percent, withstood two to three times the load of Soils Nos. 3 and 2, containing 14.2 and 13.0 percent of these constituents.

Mixing Ability of Emulsions vs. Stabilization —

An emulsified asphalt, in order to be satisfactory for the stabilization of soils, must possess an ability to mix with the soil and water in a manner such that the asphalt particles do not coagulate but remain uniformly distributed throughout the mass in its final condition.

Three tests are employed which are intended to show the resistance of an emulsion to breaking in use—the calcium chloride demulsibility, the stone coating, and the cement mixing tests. The first of these is a chemical test showing stability of the emulsion on the addition of a definite amount of calcium chloride. This does not necessarily indicate the ability of the emulsion to resist breaking when mixed with aggregates or soils. The stone coating test, now standardized for use with 1/2 in. aggregate, does predict whether an emulsion will coat that particular stone under normal conditions without breaking. The cement mixing test requires that 100 grams of an emulsion be capable of mixing with 50 grams of cement without appreciable coagulation. An emulsion passing this test satisfactorily usually will mix with most soils, but not necessarily.

It is obvious that a very stable emulsion is required to mix with many soils, but the use of the present cement mixing test may quite possibly require too costly a product for a particular job. Cement varies widely in both chemical characteristics and surface area, and an emulsion which will mix with one cement might not mix with another. The real criterion of the mixing stability required of an emulsion should be its ability to mix with the soil with which it is to be used. A soil mixing test, in which the soil to be stabilized is used, has been developed to show more accurately the degree of stability necessary in an emulsion to give satisfactory results.

The procedure for making a soil mixing test is as follows:

A sample of soil, as received, is screened through a 20-mesh sieve, and 100 grams of the sieved material is weighed into a tarred, one pound can. Twenty-five grams of distilled water are added and the mixture stirred thirty times during a half minute period. Fifty grams of emulsion are then added, and the mixture stirred 60 times during one minute. The can is tightly covered and allowed to stand 24 hrs. One hundred cubic centimeters of water are then added and the mixture stirred 60 times during one minute. The contents of the can are washed onto a tarred, 14-mesh screen by means of a wash bottle, and gentle washing is continued until all big lumps are broken up and the washings are quite clear. The screen is placed in the can and

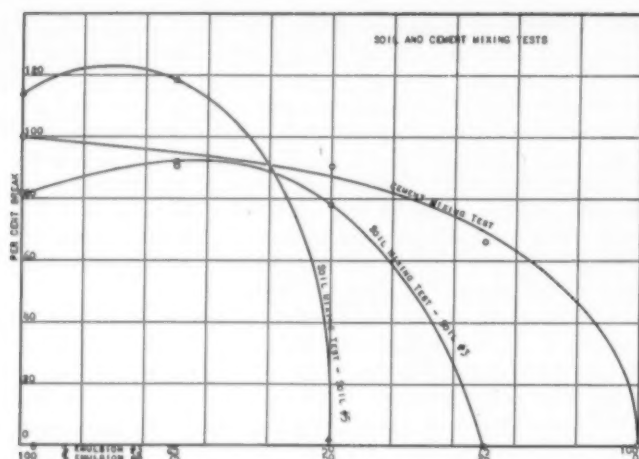


Fig. 2.—Soil and Cement Mixing Tests.

dried to constant weight at 300-350 deg. F. The grams of material (soil and asphalt) retained on the screen are reported as the "Percent Break."

In order to evaluate this new test, two emulsions, having 100.0 percent and 0.0 percent cement mixing tests, were blended in 25 percent increments to make a series of five products which would possess a wide degree of stability as determined by the cement mixing test. The blend containing 75 percent of the more stable emulsion had a cement mixing test of 66.5 percent, while the other blends were both above 90 percent. These results show that the cement mixing test, like most emulsion stability tests, differentiates stability only over a very narrow range. Mixtures of these five emulsions with two soils, one a clay and the other a sand type, show that a less stable emulsion can be used with the sandy soil, No. 5, than with the clay soil, No. 3. These data are shown in Table III and Figure 2.

These tests reveal that emulsions having the necessary stability to pass the cement mixing test are not necessary to satisfactorily mix with different types of soils. *The data show that necessary mixing stability of an emulsion can be satisfactorily determined by this soil mixing test.* If it is used in specifications in conjunction with the job in question, any specifications on demulsibility or cement mixing may safely be omitted.

Dehydration of Emulsion-Soil Mixtures—After satisfactory mixtures of soil and emulsion have been made, they must be dehydrated in order to become structurally strong and, therefore, of value as a road base. Supposedly to insure proper dehydration of the soil emulsion mixture, a test termed the "Dehydration Test" has been used to some extent on emulsions intended for soil stabilization. One hundred grams of emulsion are evaporated in a standard glass crystallizing dish for 96 hrs. at 100 deg. F., in the presence of anhydrous calcium chloride, and the percent of the total water evaporated reported as the "Percent Dehydration."

TABLE III
SOIL MIXING TEST DATA

Emulsion No:	4	1	2	3	3
Composition:					
Emulsion No. 4.....	100	75	50	25	0
No. 3.....		25	50	75	100
Tests on Emulsions:					
Demulsibility, 50 cc. N/10 CaCl ₂ 0		0	0	0	0
Cement Mixing Test.....	100.0	91.0	90.5	66.5	0.0
Soil Mixing Tests:					
Soil No. 3—Table I.....	82.0	91.5	78.5	0.5	0.0
No. 5—Table I.....	114.0	118.5	2.5	0.2	0.0

In order to study this test in relation to final compression strengths on a stabilized clay soil, 2.0, 4.0 and 6.0 percent asphalt mixtures were made using three emulsions of identical characteristics with the exception of the dehydration values, which were 5.0, 59.5 and 74.0 per cent. These emulsions all contained 58-60 percent of 60-80 penetration asphalt and had negligible cement mixing and N/10 demulsibility tests. Soil No. 3 was used for all mixtures. The data, Figure 3, show that high dehydration values result in decreased compressive strength on the stabilized soil, particularly when sufficient asphalt (6 percent) is used to result in low water absorption tests.

The relation of this dehydration test to rate of drying of stabilized soil mixtures was determined by filling quart cans to a depth of five inches with soil-emulsion mixtures, and allowing them to cure under identical conditions out-

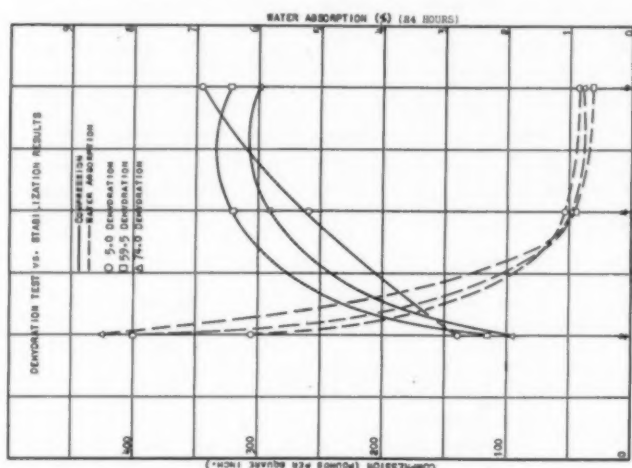


Fig. 3.—Dehydration Test vs. Stabilization Results.

doors for a period of approximately one month. No. 3 soil was used and sufficient emulsion to give three parts of asphalt to 100 parts dry soil. Dehydration values for the four emulsions were 4.5, 19.8, 45.6 and 65.3 percent, but otherwise they were comparable. The cans were weighed periodically and a record of the drying rate is

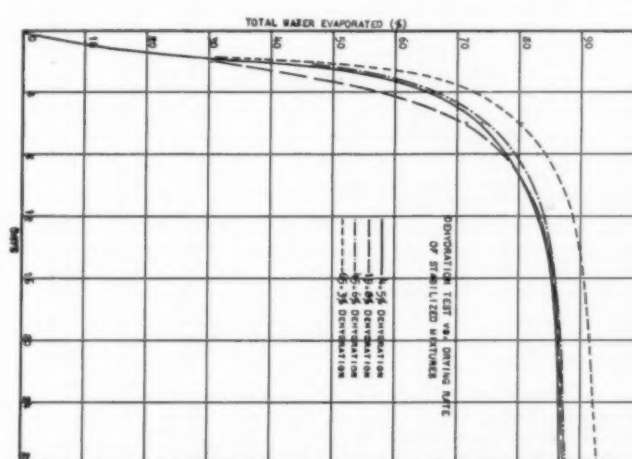


Fig. 4.—Dehydration Test vs. Drying Rate of Stabilized Mixtures.

shown in Figure 4. It is seen that, although the emulsions used vary widely in the dehydration test, no correlation exists with the drying rate on the emulsion-soil mixtures.

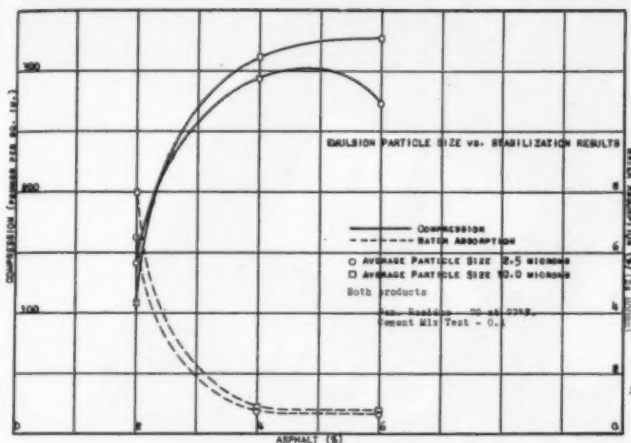


Fig. 5.—Emulsion Particle Size vs. Stabilization Results.

Effect on Particle Size of Emulsions on Stabilization—Effective soil stabilization with emulsified asphalt is dependent upon the introduction of sufficient minute particles of asphalt to block the interstices of the soil, and it would seem logical that, of two similar emulsions, the one with the smaller average particle size should be the more efficient stabilizing medium. Two emulsions were made from the same asphalt base and water phases, but on different dispersion equipment in order to obtain different particle sizes to study this theory. The resulting emulsions had average particle size of 2.5 and 10.0 microns and contained the same percentage of asphalt. It is calculated that the former emulsion contained approximately 64 times as many particles as the other.

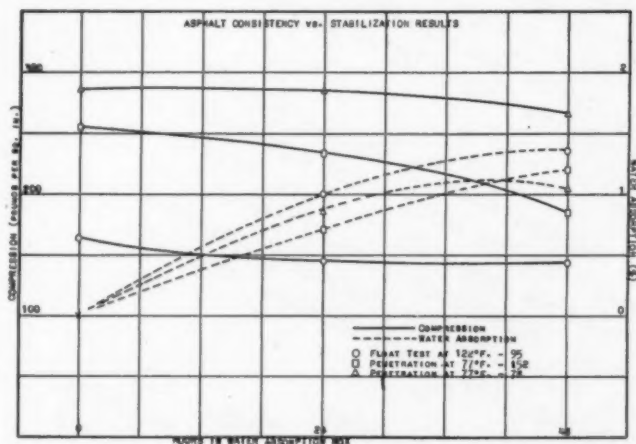


Fig. 6.—Asphalt Consistency vs. Stabilization Results.

Soil No. 3, when stabilized with these two emulsions so as to contain 2.0, 4.0 and 6.0 percent asphalt, showed very little difference in compression strength. The data in Figure 5 indicate that the smaller particle size emulsion is the more efficient stabilizer when 2.0 percent of asphalt was used, but is inferior to the coarse particle emulsions when 4.0 and 6.0 percent asphalt were used. It must be concluded that emulsified asphalt containing extremely small particles are not necessary for satisfactory stabilization.

Effect of consistency and Quantity of Asphalt on Stabilization—The incorporation of asphalt in fine particles in the emulsified form into soils brings up the question as to what effect its consistency has on the final strength of the mixture stabilized in this manner. It has been theorized that the asphalt is not a factor affect-

ing the ultimate strength of the stabilized soil, if this strength is tested when the soil is at its optimum moisture content but merely serves as a waterproofing agent to maintain this optimum moisture content. In order to investigate this point, three emulsions, having asphalt residues with consistencies of 95 float at 122 deg. F., 152 and 78 penetration at 77 deg. F., were used in stabilizing No. 3 soil to 4.0 percent bitumen content. The dried mixtures were subjected to water absorption tests of 24 and 48 hrs. before breaking. The results of these tests (Figure 6) shows definitely that harder asphaltic residues result in increased strength of the mixtures. This is true in the case of the dry specimens as well as those subjected to the one and two day water absorption tests. It appears, then, that the asphalt actually plays an important part in strengthening the mixtures, although excessive strength from the use of

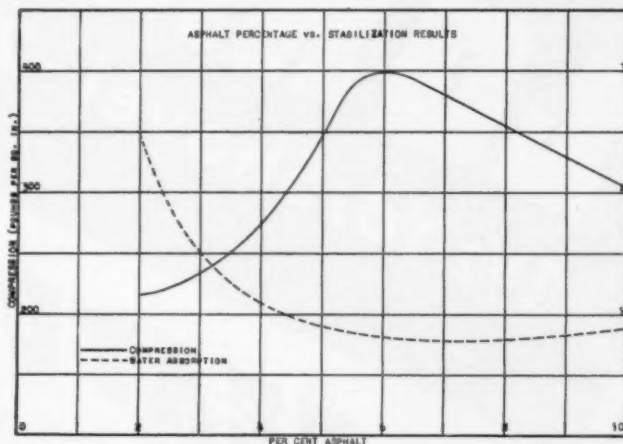


Fig. 7.—Asphalt Percentage vs. Stabilization Results.

hard asphalts may not be necessary or desirable. Adequate stability with maximum water resistance is frequently more important.

The desirability of having a rapid means of evaluating soil mixtures is obvious, since it is usually necessary to run a number of tests with various amounts of asphalt in order to determine the optimum quantity to use. Figure 7 shows mixtures made with No. 3 soil and a typical emulsion with a 72 penetration residue to contain increasing amounts of asphalt from 2.0 to 10.0 percent with a clay type soil. Over this range the compression values reach a decided maximum at 6.0 percent. Below this percentage lower compression values were obtained, probably due to higher water absorption. Mixtures made with 8 and 10 percent asphalt had com-

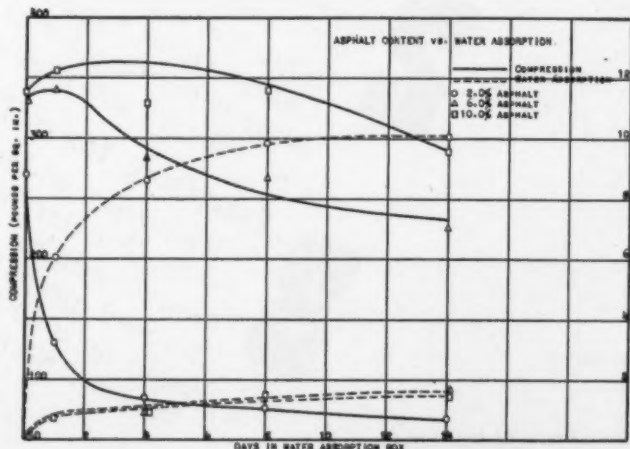


Fig. 8.—Asphalt Content vs. Water Absorption.

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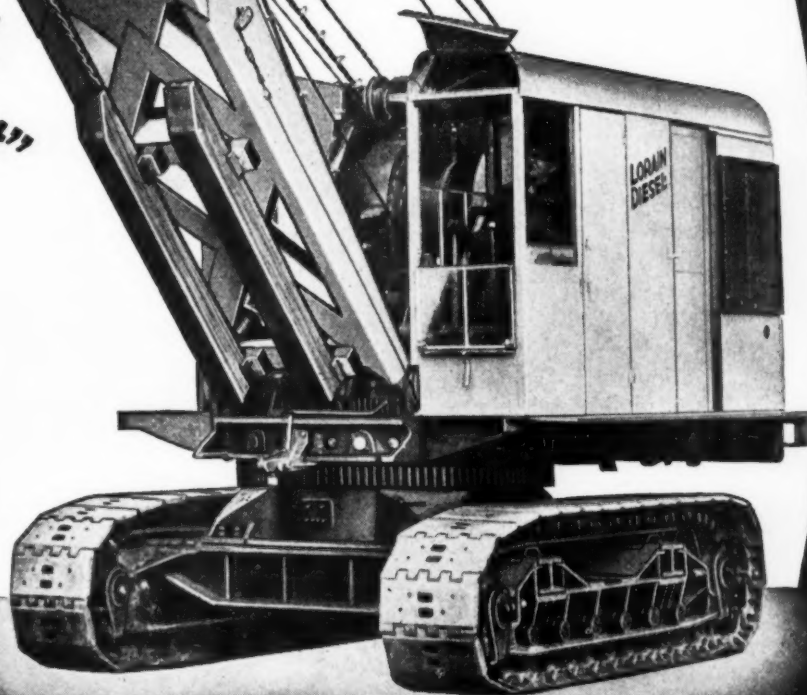
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pression tests below the maximum due to being over-bituminized, as indicated by their decreased specific gravities.

The effect of the quantity of asphalt used on the water absorption of mixtures has been determined as shown in Figure 8. No. 3 soil was stabilized to contain 2.0, 6.0 and 10.0 percent asphalt. Dried mixtures were left in the water absorption box for periods of 0, 1, 4, 8 and 14 days, at which times the amount of water absorbed and the compression strength were determined.

These data show that the use of a sufficient amount of bitumen to reduce the tendency of the mixture to absorb water in service is essential. This is true even though the use of this amount results in strength somewhat less than the maximum obtainable since the use of insufficient asphalt may result in a tendency for the mixture to continuously absorb moisture by capillarity and, thereby, lose stability in service.

Emulsion-soil mixtures must be allowed to dehydrate on the job to such an extent that the emulsion is completely broken and the asphalt becomes present as such in a sufficient quantity to prevent further water absorption in service. If these conditions are not fulfilled, stabilization has not been properly accomplished and the results will not be permanently satisfactory.

Properly stabilized soil bases should possess reasonably high compression strengths, but they are only slightly resistant to abrasion and, therefore, should be primed with a light application of quick-breaking emulsion, or other bituminous material, and covered with suitable waterproof wearing surfaces designed for the traffic anticipated.

Conclusions—There are many methods of testing soil-emulsion mixtures in the laboratory and the numerical results of strength obtained vary widely. These results are significant only as a guide to the selection of the proper proportion of asphalt to soil and little correlation with the actual stability required in a finished product is available. The method outlined is simple and rapid.

It is essential that properly stabilized soil bases be resistant to water absorption. The indications of the data are that, if a maximum of 1 percent is absorbed in the 24 hour test outlined, the mixture should be satisfactory. By extending this test a few days, more definite and conclusive data regarding the resistance of a mixture to water can be obtained and this procedure is desirable before final recommendations are made for a given project. Sufficient asphalt should be used to that the water absorption does not increase with time but reaches an essentially constant low figure in a few days.

The data also indicate that some of the tests now being used to specify emulsion asphalt intended for soil stabilization work are not significant. It is quite possible that a suitable soil mixing test can be substituted for some of the tests now in use and that other tests can safely be dropped.

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TIMBER BRIDGE DESIGN CONTEST ANNOUNCED

Under the joint auspices of the National Lumber Manufacturers Association, American Forest Products Industries, Inc., and the Timber Engineering Company, the latter company is offering prizes of \$1,500 in cash in a timber bridge design contest. It is open to students of architecture and engineering as well as graduates of both courses of study.

The rules require that the design submitted shall be of a highway bridge constructed of timber and employing the timber connector method of construction. The live load may be H-10 or H-15 and the span may vary from 30 ft. to 70 ft., measured from center to center of bearings, but using only spans divisible by ten. The roadway must be 18 ft. in the clear. Piers or supports need not be designed beyond the anchorage of the bridge to a concrete pier which shall be assumed to have already been designed. Assumption for dead loads should be stated on the drawing and the design should be predicated on the use of American Standard sizes of dressed lumber and timber surfaced on four sides.

The purpose of the contest is to acquaint designing engineers with the latest developments and design practices of modern timber construction. As an added incentive to students the prize money has been divided into two classifications: (1) for all contestants and (2) for students only.

The grand prize will be \$500 in cash and will be awarded to that contestant who submits, in the opinion of the judges, the best design for secondary highway use. In addition there will be six other prizes in this division from \$200 for second best design down to \$50.

The student submitting the best design will receive \$200 in cash, unless a student design is selected for the grand prize. Seventeen other student prizes totalling \$300 will likewise be awarded making twenty-five awards in all amounting to \$1,500.

The decision of the judges will be final. Judges are: R. G. Kimbell, Director of Technical Service; F. J. Hanrahan, Structural Engineer; L. M. Stevens, Architect, all of the National Lumber Manufacturers Association; J. E. Myer, Chief Research Engineer of the American Forest Products Industries, Inc., and J. H. Carr, Jr., Structural Engineer for the Timber Engineering Company.

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EDITORIAL

On Reading Advertising

ONE day, while on a field job, we had reason to get some information from the contractor's headquarters office. We dropped in unannounced and were gratified to see the executive thumbing over the pages of *ROADS AND STREETS* which had just arrived. He was reading the advertising. We asked if he always looked at the advertising. He said, "I always read the advertising first."

This was a revelation to us, considering the effort we put forth to get factual information on jobs, research or other educational matter pertaining to the road and street field. Consequently a few questions were in order and they were readily answered. This man, it was revealed, has made a practice of reading advertising because of the boiled down information contained in many of the advertising pages. From the pictures used to illustrate the advertising he has gained ideas which were convertible into dollars and cents to him. Much of the copy contained unit output figures for a certain job and stimulated him to an analysis of his own work.

When one stops to think about the matter—how advertising copy is prepared, what are the fundamental data, the constant effort to get pictures from actual field operations, and the time spent to reduce information to as few words as possible, it becomes readily apparent that the advertising pages contain useful information and ideas, and that every reader should read every advertisement. Advertising matter in *ROADS AND STREETS* is kept within bounds, not by the advertising editor so much as by the advertising managers of the manufacturers. They constantly check their copy for ethical standards and we wish to pay a tribute to them here for their conscientious efforts.

We commend to our readers the policy of reading advertising pages just the same as reading the editorial matter. You will find "it pays."



More About Equipment Sales Policies

FEDERAL, state, county and city engineers who have jurisdiction of road and street construction awards owe it to themselves and to their employers to investigate agreements by which contractors to whom they are about to award a contract, obtained or expect to obtain equipment necessary for prosecution of the contract. It stands to reason that a higher price paid for a piece of construction equipment under one form of purchase agreement than the price paid for the same piece under another form of purchase agreement will be reflected in

a higher bid price on the construction work. It also stands to reason that a manufacturer can sell a piece of equipment at a less price for cash than for time payments. The contractor who pays cash for the equipment he expects to use on a contract job can, therefore, justifiably bid a lower price for a contract than if he were renting the equipment. This, of course, presumes that there is enough work for all contractors or that the number of contractors will have to be kept within the number required to do the available and proposed work. It naturally follows then, that engineers, before they award a contract, should require the contractor to show clear title to the equipment he expects to use, or to show that he has enough cash with which to purchase needed new equipment, over and above working capital, and that clear title to the new equipment will be obtained within a specified time limit.

Of course, if the total of rental and repair costs on the rented equipment is less than the annual depreciation cost of new equipment chargeable to a job, then the rental basis would be more advantageous because it could be reflected in lower unit construction prices. Again, it stands to reason, however, that rental rates for new equipment are bound to be higher than annual depreciation of new equipment chargeable to a job. If this latter were not true, the manufacturer who rents new equipment, on a rental purchase basis, would soon go broke or have all of his funds tied up in equipment, no longer new and not yet paid in full.

The policy of selling new equipment on what amounts to a rental basis is uneconomic and fraught with many possible complications for increased cost of construction work. The practice should be stamped out.

Presumably, the reason responsible contractors try to follow the rental plan for obtaining new equipment is that he takes no risk with his own funds, or rather that he takes less risk, in case he meets adversity, and that he has, so far, been able to charge rent as an expense item on his income tax return. When the federal revenue collectors discover that the rental charged as expense was really a partial payment for equipment purchase, the contractor may find on his desk, some morning, a letter requesting payment of back income tax erroneously avoided. The partial payments (amounting in reality to rent) policy of equipment purchase is unsound. Road and street engineers should give this point some concerted investigation.

One manufacturer expressed himself on this subject as follows:

"Your editorial on page 62 of the December, 1938, issue of *ROADS AND STREETS* is timely and apropos to the present day tendencies in construction equipment selling. We appreciate that



When the **RED** *flashes...*

"TRACTIONIZED" TARVIA PAVEMENT WILL GIVE TIRES A FIRM TREAD HOLD

THE BARRETT COMPANY New York • Chicago • Birmingham • St. Louis • Detroit • Buffalo
Providence • Lebanon • Rochester • Baltimore • Minneapolis • Cleveland • Columbus • Philadelphia • Toledo
Youngstown • Syracuse • Hartford • Boston • Cincinnati • Bethlehem • Portland, Me. • Norwood, N. Y.
In Canada: **THE BARRETT COMPANY, LTD.** Montreal • Toronto • Winnipeg • Vancouver

AMERICA'S LEADING MANUFACTURER OF COAL-TAR PRODUCTS • ROOFINGS • TARVIA • CHEMICALS

article and hope the other magazines will follow through after the leadership you have shown.

"But why include only the poorly financed contractor? Our greatest worry has been the amply financed, well organized and reputable contractor. It is the large contractor who is looking for avenues to escape some of the taxes that are incident to construction. If the large contractor can rent [equipment],* he can charge as expense practically the purchase price of the [equipment] over a two-year period, whereas the Federal Revenue auditors will not permit a depreciation load over less than a five-year period.

"Most of the complete [equipment] sold to meet the present day low competitive prices will come to between \$20,000 and \$30,000. These contractors are getting paid on a tonnage or yardage basis, and it seems an easy step for them to charge into the job, equipment rental on a yardage basis. They can show the Revenue people that they are paying that much rent on new [equipment], and that the rental contract does not show an option to purchase, they feel justified in charging the rental into expense.

"We passed up, last year, two \$25,000 deals, both with reputable contractors who were capable of paying cash for the equipment. Both wanted our [equipment]. One of the deals was lost to a manufacturer who makes a general practice of renting, the other contractor decided to continue on with his old equipment if he couldn't prevail upon us to take the deal. The contractor that purchased the competitive [equipment] had 96,000 tons under contract—he offered us 10c a ton plus freight, on a \$22,000 deal, but his offer to our competitor was 10c a ton on 66,000 tons, and the competing manufacturer could repay the freight. Their deal also approximated \$22,000.

"We have always brought before the reputable contractors the thought that it is the protection to the legitimate contracting fraternities that manufacturers do not rent. There is no stopping this rental policy if it gets under way. Like measles, it is catching. It wouldn't be long before a manufacturer would enter into rental deals with the wholly financed contractor with its natural dangerous implications and complications.

"A short time ago, a reputable contractor submitted to us a proposition to rent [equipment] for a period of 16 months, for which the customer offered to pay a rental of \$28,000, and by which agreement, the customer is given the option to purchase the equipment at the end of the rental period for \$3,000 cash. The customer desired the contract in this form so that he could charge off the \$28,000 as operating expense in connection with his tax returns.

"We maintained that we did not believe that his plan would accomplish the result he desired. We felt that the taxing authorities would take the position that the contract is actually one of purchase and not a rental, and that the contractor would shortly find that his \$28,000 charge off to expense would not be permitted.

"In closing, we hope that you will expend a little bit more effort in your editorial comments regards equipment sales policies, including also reputable contractors. At present, they are as bad or worse.

"A good solution would be that the state and federal, county and city departments would demand in their qualifications that all bidders show clear title to the equipment they expect to use, or that they have enough cash to buy what they need but do not have."

*The brackets [] are ours.—Editor.

Need for Technical Division of the American Road Builders' Association

WE have been advocating that a new division of activity should be established within the American Road Builders' Association, a Technical or Engineering Division. We believe this Technical Division should have as one of its important jobs the reduction of the time-lag between highway research developments and common practice. Another function would be that of studying materials and equipment for certain types of work and rendering technical reports upon them; another, previewing technical papers to be presented at a convention for the purpose of eliminating duplication; another, recommending highway subjects upon which more research information is desirable; another, collecting and

editing convention papers prior to publication; another, assembling highway information, regionally, such that as a few years pass, an encyclopedia of accepted highway engineering and construction can be logically arranged and compiled. These are only a few of the many functions of such a Technical Division. Some discussions with individuals and groups have indicated the advisability of the move.

The question of time-lag between research and the placing of its results into general practice was discussed in a letter to the editors, as follows:

"While the further distribution of research information would no doubt have some effect, it would seem to me that there are several other underlying causes for this lag which are very definite or naturally fundamental which are just as important.

"I have noted a recent article, 'Industrial Research and Economic Progress,' by Dr. Karl F. Compton, President of M.I.T., where, in speaking of this 'time-lag,' he points out that 'while an improvement of an existing product may be made and marketed quickly, a really new product, however excellent, finds its mark slowly' and 'that one company expresses its experience in the formula from the laboratory to the freight car equals seven years.'

"This would seem to indicate also that this question of time-lag was not confined to the highway construction, maintenance and operation field alone, however, as that is our primary interest, a few examples from this field will serve best to indicate what is meant.

"We are all familiar with the fact that some states are much more willing to try something new than others, also with the general tendency for no two states to do a particular operation the same way or to use the same design. Take for example, the question of type of reinforcing and how it should be placed in concrete pavement. Certainly there must be one which for all general purposes is the best but because of a difference of personal opinion or promotional influence, it may be a long time before it is adopted nationally as standard. You will recall the remarks made during the meeting (Highway Research Board) about the statement Mr. Upham made about the Germans adding $\frac{3}{4}$ in. to the thickness of their slab and leaving out the reinforcing." * * * * *

Bridge Cleaning

WITH Spring in the offing it is time to begin organization of bridge cleaning, repairing and painting equipment and material. Some states have a policy of renovating all bridges on the state highway system semi-annually. Many counties allow intervals of decades between periods of bridge cleaning and painting. While cities often do better, they can still show improvement. A dull appearing, rusty, or unpainted bridge in a city or town detracts to a greater degree from the appearance of the town than does a bridge in the same state of disrepair in the rural sections.

We suggest two-man checkup crews get started now, preparing an inventory of bridges in the various political subdivisions having jurisdiction. Each crew could be assigned to specific districts and given such equipment as sidewalk scrapers, push brooms, a pick axe, chisel pointed bars, wrenches, sledge hammers, rope and slings, brushes and paint. It should be their duty to minutely cover each bridge and correct plugged drains, bent railings, missing bolts, loose nuts, loose expansion plates, and paint the bridge, unless it is a large one, in which case a large paint crew should follow the two-man crew.

Dirt and sand from bridge floors and truss members, from bridge seats and roller or rocker bearings should be removed. Channels under the bridges should be cleared and all brush and trees adjacent to the bridges should be removed. Excess washing or cutting of banks and fill slopes under and around the bridges should be reported in detail so that dirt moving repair crews can correct the erosion.

Keep the two-man crews busy all year round.

GALION ROAD MACHINERY

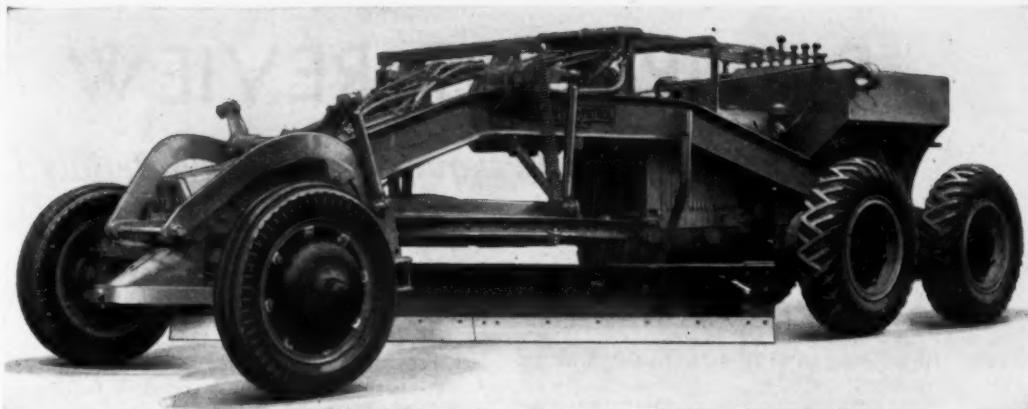
Motor patrol graders; 3 types and choice of power.

Pull-type graders; a size and type, manual or hydraulic control, to meet every requirement.

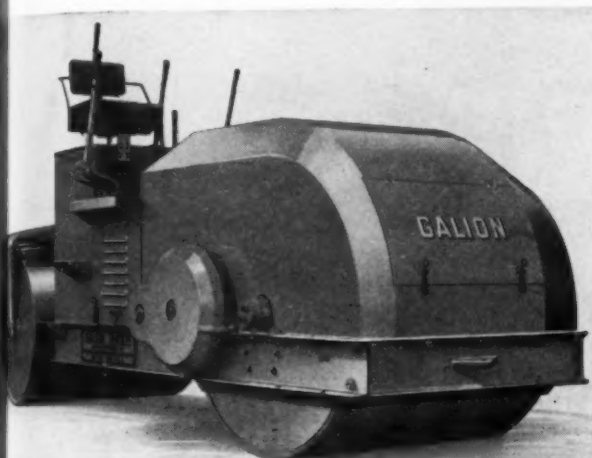
Rollers; 3-wheel, tandem, portable, sheep-foot, International and trench types.

Spreaders; for chips, sand, stone, asphalt, etc.

Sanders; Maintainers; Rooters; Drags.



Galion Standard motor patrol grader. Also Junior Patrols and Master Diesel types.



Galion tandem rollers can be furnished in weights from 5 to 14 tons. Gasoline or diesel engine.



Galion spreaders give perfect performance in distributing a wide range of fine materials. Pneumatic tires and bronze axle bearings make these units easy to handle.



Galion No. 178 leaning wheel grader with manual control and pneumatic tires.

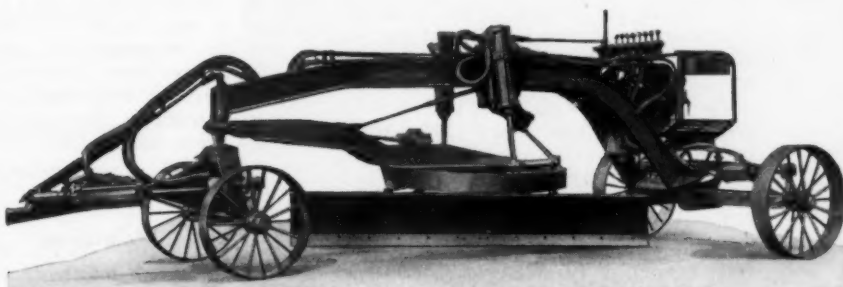
We Go Out of Our Way

- To Help Cut Costs
- To Make Your Job Easier
- To Offer the Best in Road Machinery
- To Provide a Complete Line of Modern, Durable and Efficient Units

For over thirty years the name "Galion" has been before the public—and during that time the company has achieved a distinctive place in the industry . . . that of Road Machinery Specialists. This position carries with it a responsibility to which Galion is keenly alive . . . that of furnishing modern, efficient equipment at low initial cost and designed for economical maintenance.

Galion builds reliable road machinery . . . the kind you can put faith in . . . the kind that will perform as you would have it perform if you were building it yourself. You will be satisfied with its looks, its performance, its economy and its durability.

Literature and engineering data sent upon request.



Galion No. 120 leaning wheel graders with hydraulic control. A complete line of pull graders with moldboards ranging from 7 to 14 ft.



THE GALION IRON WORKS & MFG. CO.

Main Office and Works: GALION, OHIO

Export Division: COLUMBUS, OHIO

EQUIPMENT REVIEW SECTION

Developments in Equipment and Materials During 1938

GRADERS AND MAINTAINERS

Diesel Auto Patrol

A heavy-duty, self-propelled road grader, the Diesel No. 12 auto patrol, was announced by Caterpillar Tractor Co., Peoria, Ill. A 6-cylinder "Caterpillar" Diesel engine delivers 66 brake horsepower, and is mounted over the driving axle to best utilize its weight in preventing wheel slippage. A gasoline starting engine insures easy starting regardless of atmospheric temperatures. The transmission offers six forward speeds and two reverse. A low speed of 1.8 m.p.h. provides maximum pull for the heav-



Caterpillar Diesel Auto Patrol

iest jobs, and slow speed for fine grading. Second speed is 2.8 m.p.h., permitting faster operation on most ditching and other heavy work. Four higher speeds of 4.3, 6.8, 9.6, and 15.2 m.p.h. give ample speed range for road mix, snow removal, travel, etc. Reverse speeds are 2.4 and 3.8 m.p.h. The Diesel No. 12 auto patrol is equipped with two speed mechanical power controls. A simple shift of a lever in the gear box gives faster control for the longer blade movements on coarse work. For close finishing work, requiring extreme accuracy in blade settings, the slower control is quickly available. The new auto patrol is offered with tandem drive and leaning front wheels as standard equipment.

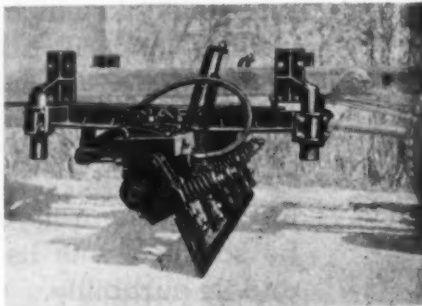
New Attachment for Motor Grader

The Austin-Western Road Machinery Co., Aurora, Ill., announced that three new attachments will be on display at the San Francisco Road Show—mounted on a standard all-wheel drive and steer "99" motor grader. The first is a rear-mounted roller that is raised and lowered by hydraulic power. It measures 6 ft. long by 30 ins. in diameter and is built in three sections for operation as a 2, 4, or 6-ft. roller as desired. Each section, which may be filled with water, provides an estimated compression of 197, 252, or 470 lb. per lineal inch, with a 6, 4, and 2-ft. width roll respectively. When roller operates, the rear drive wheels of the motor grader are elevated above the ground, yet there is ample traction and power in the front

wheels of the "99" to meet all rolling requirements. The second is a 2-gang disc harrow for front-end attachment, ahead of the wheels; it is operated hydraulically and can be lowered to a maximum depth of 6 ins. below the front tires. It consists of 18, 20-in. diameter discs spaced 4 ins. apart, arranged in inverted V-formation so that material travels toward the center from each side. Harrow covers a maximum width of 70 ins., each section has three angle adjustments of 5°, 10°, and 15°. The third attachment is a power-driven, rotary broom mounted just ahead of the blade; it is raised and lowered hydraulically from the cab and does a most thorough job of cleaning the road surface. It measures 8 ft. long by 26 ins. in diameter and is driven by a special hydraulic motor.

Blade Road Maintainer

An improved Monarch spring blade road maintainer for undertruck mounting was brought out by the Monarch Road Machinery Co., Grand Rapids, Mich. The cutting blade is hinged and locked against lifting over obstructions or digging into soft spots in the road. Horizontally mounted compression springs permit a limited and fixed arc of action. Controlled from the cab by the truck driver, the Monarch is operated by means of hydraulic cylinders (oscillating type) built into the scraper. Suspended from semi-circles at-



Monarch Spring Blade Road Maintainers

tached without drilling holes in the truck frame, a wide range of working angles is possible. Maintenance at speeds from 8 to 15 miles per hour is recommended; and when in transit from garage to job, or when the truck is otherwise engaged, the scraper raises automatically to clear 8 in. above the road.

Maintainer

A high speed maintenance unit was added to the line of the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Essentially this unit is a medium size, rubber tired wheel tractor with a 9 ft. blade mounted perpendicular to and in the approximate

center of the wheel base. From his seat, the operator of this 1-man unit controls the blade by rotating two large hand wheels. The moldboard itself is mounted on a "centerless circle" and is adjusted to the proper angle by merely changing two bolt positions. The blade assembly drawbar is attached at the front of the tractor leaving the standard drawbar unobstructed.

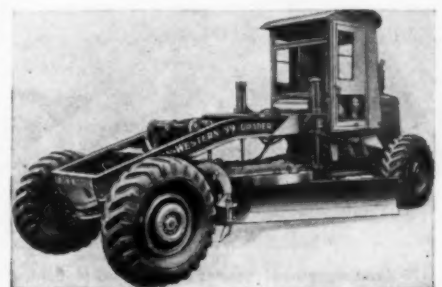


The Speed Maintainer

Excellent visibility combined with high speeds gives unusually good working characteristics to the speed maintainer. Four speeds forward—9, 4¾, 3½ and 2½ m.p.h. plus a 2 m.p.h. reverse are available. The power plant is a heavy duty valve-in-head, 4-cylinder engine fitted with removable cylinder liners and valve seat inserts. Lubrication is by the full pressure system. Either regular gasoline or distillate can be burned.

Motor Grader

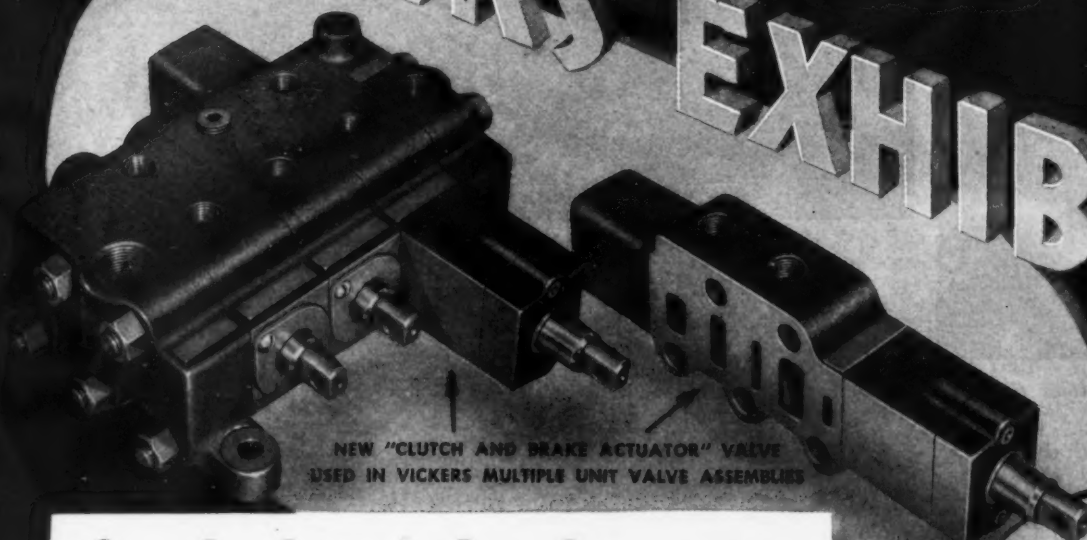
The 1939 model of the "99" motor grader of the Austin-Western Road Machinery Co., Aurora, Ill., is shown in the illustration. Each wheel is power driven and the frame can be offset by steering to distribute power over the entire blade and utilize the full engine output. The weight of the machine with gas unit is 16,000 lbs.; with Diesel power, 17,000 lbs. The wheel base is 17 ft., and the standard blade 13 ft. Road speeds are five forward: 1.56 to 10.2 M.P.H.



99 Motor Grader with 13.50 by 20 Single Tires

VICKERS EXHIBIT

See the



NEW "CLUTCH AND BRAKE ACTUATOR" VALVE
USED IN VICKERS MULTIPLE UNIT VALVE ASSEMBLIES

for the latest developments in POWER HYDRAULIC CONTROLS

Engineering enterprise and research keep Vickers Oil Hydraulic Equipment in the forefront of progress. The Vickers Exhibit at the Road Show will be, therefore, an important one for every visitor. Latest developments . . . such as the new Clutch and Brake Actuator Valve shown above . . . will be demonstrated. The new Vickers Fluid Motors, which apply rotary power, will also be shown.

Vickers pumps have hydraulically balanced rotors—eliminating radial thrust with consequent bearing wear. Vickers balanced spool type valves assure "finger-touch" control, no matter how heavy the load. Vickers construction is so rugged that maintenance is reduced to a new low.

Upon these fundamentals Vickers has built a line of controls for road and construction machinery which every manufacturer and user will want to see.

VICKERS Incorporated

1422 OAKMAN BLVD., DETROIT, MICHIGAN

VICKERS PUMPS AND VALVES

for operating

ROAD BUILDING AND
MAINTENANCE MACHINERY

EXCAVATING AND
CONSTRUCTION APPLICATIONS

POWER STEERING AND
HYDRAULIC HOIST DEVICES

TRACTOR AND
SNOW REMOVAL EQUIPMENT

. . . they have

Finger-touch Response
Simplicity and Flexibility
Complete Self-Lubrication
Minimum Maintenance



Medium-Size Motor Grader

A new motor grader, known as the No. 302, was announced by J. D. Adams Co. of Indianapolis, Ind. It is a medium-size, popular-price machine, which, it is claimed, is capable of building and maintaining roads from bank to bank, including back-sloping. The No. 302 is similar in design to the large Adams heavy-duty motor grades and has many of the same features



No. 302 Medium Size Motor Grader

of design and construction. It employs the monomember frame which characterizes other Adams machines and which allows for better blade visibility plus a wider range of blade positions. It is claimed that this is the first motor grader of this size on which the blade can be swung outward to cut high or low back-slopes.

Subgrade Planers and Testers

A new adjustment for subgrade planers and testers (not motorized) was developed by The Heltzel Steel Form & Iron Co., Warren, O. The planer may be adjusted 2 ft. from any base size by simply loosening a few bolts on the carriage and ex-



Heltzel Subgrade Planer

tending the wheel assembly crosswise on the main frame. Extra blades are already in place behind the foremost end blades—making major changes, adjustments or additions unnecessary. The tester is adjustable in the same manner.

CONCRETE MIXERS, PAVERS, VIBRATORS AND FINISHERS

14-S Non-Tilt Mixer

A new 14-S non-tilt mixer in four-wheel end or side discharge models was brought out by the T. L. Smith Co., Milwaukee, Wis. The new machine is said to incorporate many refinements that speed up all three phases of the batch cycle—loading, mixing and discharging. Like all Smith mixers, it has an "End-to-Center" mixing action. Ten full-width buckets continually work the batch from the ends to the center. The drum is unusually narrow, with an extra large diameter and bigger drum openings. The complete machine is

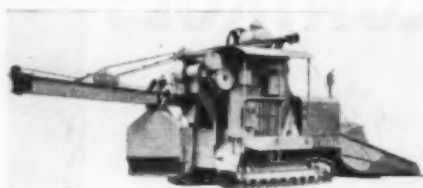


New Smith 14-S Mixer

of sturdy all-steel construction, compact and lightweight. Features include single center gear ring and roller tracks, drum rollers turning on dustproof ball bearings, enclosed gear reduction, multiple "V" belt drive, outside band clutch and skip brake, oversize streamline skip equipped with automatic skip vibrator, accurate syphon-type water tank, auto-type steering, spring-mounted axles, anti-friction bearings throughout.

Pavers

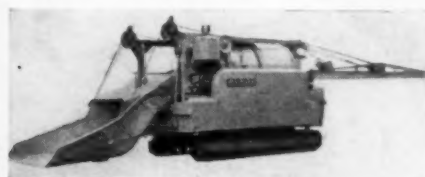
An improved Rex 27-E paver for 1939 was announced by the Chain Belt Co., Milwaukee, Wis. The paver is built around the Rex modern all welded mixing drum which is constructed of high carbon steel drum heads and center sheet with alloy steel buckets and blades. The buckets and blades have replaceable liners to provide greater resistance to wear and abrasion. Flexible rubber sealing rings



Rex 27-E Paver

insure maximum drum capacity on grades and insure all concreting going into the slab. The Rex high carbon steel drum track is welded integral with the drum and is carefully machined so there is no vibration and no flat spots. The wide drum rollers are mounted on Timken bearings. Probably the outstanding feature of the Rex 27-E paver is the Rex mechanical man which performs automatically all the operations necessary to get the mixed batch out in the bucket and get the new batch in the skip into the drum and mixed. It does everything but lower the skip. All operations are handled mechanically—all are at the correct time to the split second—all are completed swiftly and efficiently. The operator of the Rex 27-E paver merely steps on the foot pedal and the Rex mechanical man carries on from there. The Rex modern drum is driven by genuine Rex Chabelco Chain drive. All power take-off

shafts ride on Timken or Hyatt roller bearings, depending on the type of load. The Rex traction transmission is built of special steel gears operating on nickel steel shafts in oil in reinforced case.

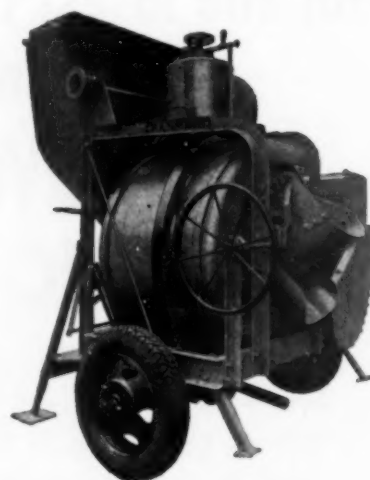


Rex 34-E Duomatic

The new Rex super highway paver (Rex 34-E Duomatic) is shown in the accompanying illustration. Four separate batches of concrete are handled in this paver at one time. A new development last year, it was tried out and has now gotten into production.

7-S and 10-S Mixers

The new 7-S and 10-S model V mixers, announced by the Ransome Concrete Machinery Co., Dunellen, N. J., have heavy steel channels welded in a one piece chassis, with two extra cross members for drive support and two extra longitudinal



Ransome 7-S Mixer

members for supporting the drum and rollers. Drum roller shafts are of extra heavy specially treated alloy steel and adjustable so as to compensate for wear on rollers and traction rings. An exclusive mixing action is provided through the shape and design of specially designed mixing blades (patented). Water control is provided by means of the Ransome spiral cut-off water tanks. Self-aligning bearings on which the countershaft and winding shafts are mounted are provided. A roller chain drive from engine to drive countershaft is used.

Concrete Mixers

One of the outstanding features of the 1939 line Speedline mixers of the Jaeger Machine Co., Columbus, O., is the improved and more compact design, including the replacing of the back-lashing lift cable and big overhead sheave with a single

A NEW LIGHT MACK!

WITH ALL THE QUALITIES THAT MADE
THE "BIG MACKS" WORLD-FAMOUS!

• Here's the greatest truck sensation of the year—the unequalled stamina, dependability and the long run economy of a thoroughbred Mack within the reach of new thousands of small operators! Mack now offers the most complete line of trucks in the world . . . before you buy *any* truck at *any* price be sure to see the new Mack line at your nearest Mack dealer or direct factory branch. Or write for full details to Mack Trucks, Inc., New York City.



AND LOOK
AT THE PRICE

\$ **675**

F.O.B. Factory, Chassis Only.
Cab, Body and Taxes Extra.

... FROM ONE TO THIRTY TONS—IT'S A



Another Step FORWARD!

WITH
Etnyre

★ WELL! WELL! It looks as though Etnyre has something new.

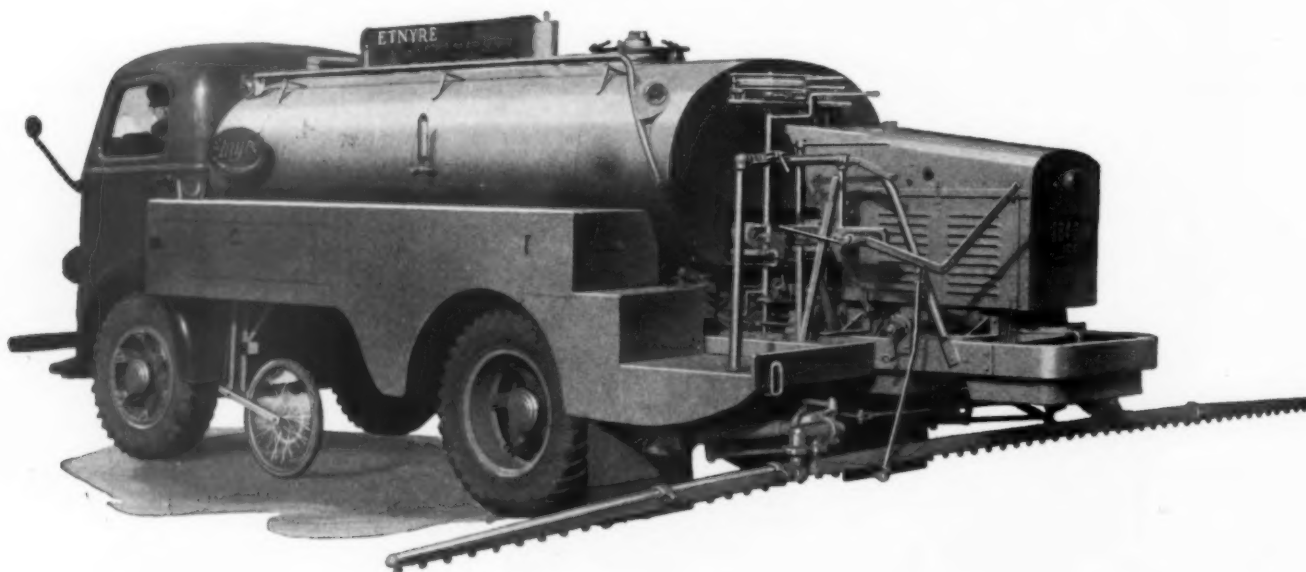
That's a swell bunch of pictures and I sure would like to have a fine-lookin' job like that to start out with this year.

Now let me see. They turn the bar up to clean. That seems funny to me for when the bar is turned up, the material can't get out. Oh yes it can. Yes, now I see.

the kind of a distributor that would save me money.

I don't know what to think of this crown adjustment, but I do know that the Inspectors and Engineers like to have the bar the same distance from the ground.

It's strange, but Etnyre is the one that always licks these problems. **They must know what it takes.** They raise and lower the bar with that lever to keep it always the same height from the ground. I can see how this



When you open the Vacu-Flo valve it creates a vacuum and all of the material in the bar and lines flows back to the sump and up thru the Vacu-Flo tubes into the tank. **That's not a bad idea**, for when the bar is turned up there is no drip and none of the material is wasted. I always said that I could depend on Etnyre to give me

crowned and tapered bar when turned up will clean quickly but I can't see how they make it fold back when the end of the bar hits something and then also folds up for traveling, but they say it does. **I know it will, for you can depend on what Etnyre tells you.** I am just going to find out how this is done by writing direct to



E. D. ETNYRE & COMPANY
OREGON, ILLINOIS

TURN-UP Folding SPRAY BAR

with VACU-FLO CLEANING SYSTEM

**The 1939 Etnyre Blacktopper Model FX Distributor is equipped with
TURN-UP FOLDING SPRAY BAR**

A bar 24 ft. long made in sections, joined by metal to metal joints with clamp screws, quickly and easily adjustable to spray any width from 3 to 24 ft., is standard equipment. Extensions for longer bar can be furnished.

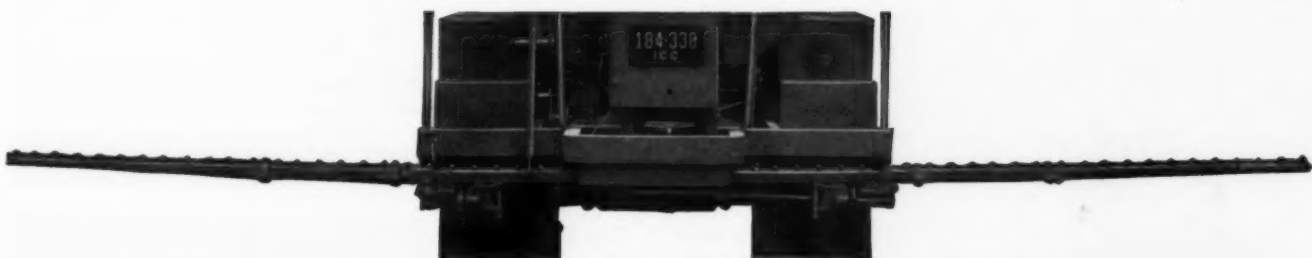
Bar is divided so that it will spray on either or both sides of center.

It is of the non-drip type and is adjustable by lever to maintain constant height from ground to give uniform triple-lap spray.

This new bar is adjustable from a straight bar for airport work to a drooping bar to conform to the crown of any road. Illustration shows the drooping bar.



SPRAYING POSITION



CLEANING POSITION

In the turned-up position the bar and distributing lines are pitched downward so that all of the material in the bar and lines flows to the sump where the tube connections on the Vacu-Flo cleaning system pick it up and return it to the tank.

The end sections fold when the bar is in horizontal position to give traveling clearance.



TRAVELING POSITION

Should the end of the bar hit an obstruction on the side of the road while spraying, it will swing back, thus preventing damage to the bar.

★

Nozzles on 4" centers give triple-lap uniform spray with

**NO DRIPS! NO SKIPS!
NO LEAKS! NO STREAKS!**

**See us at Space B-15, Exposition Auditorium, A.R.B.A.
or Empire Hotel, San Francisco, March 7-10th.**





Jaeger Speedline Mixers

skip cable from a low, accessible counter-shaft. This and other features of construction save hundreds of pounds in weight, while permitting oversize construction in machined steel drum tracks, engines, clutches, shafts, gears, and bearings for longer life and lower upkeep. Another of the particular features is the spring shock absorber mounting of pneumatic tired wheels on Timken bearings, permitting towing of big mixers in back of a fast-moving truck or car. Two and 4-wheel mountings are also interchangeable.

Concrete Vibrators

During the past year the Mall Tool Co., 7740 South Chicago, Ill., brought out the following: A full width highway concrete vibrator; a short coupled universal electric concrete vibrator; a mass concrete vibrator. The highway vibrator is available powered with either gas engines or electric motors. The gas engines operate independently of air compressors or genera-



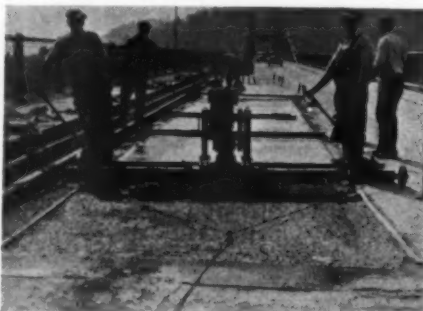
Mall Full Width Highway Pavement Vibrator, Powered with Two 3 H.P. Gas Engine Units, in Use on a 20-Ft. Pavement

tor sets, the power being transmitted to the vibrator by means of heavy duty flexible shafting. The electric sets can be operated directly from the generator sets of the finishing machines. Single vibrator units can be furnished for pavements up to 11 ft. in width and double units for pavements up to 20 ft. in width.

Pressure-Vibrating Screed

A pressure-vibrating screed machine for placing and bonding a new concrete surface to a defective concrete road surface was brought out by The International Vibration Co., 16702 Waterloo Road, Cleveland, O. The old road surface is first scarified to present a clean surface for the new topping. A head of low water-cement ratio concrete or mortar, depending on the thickness of the new top,

is then placed and kept in front of the pressure-vibrator, which is drawn slowly over the surface by winch or other suitable methods. The bottom of the screed being tapered from front to back, with the larger opening in the front, creates and maintains through the forward movement, a constant pressure on the concrete being placed, while at the same time the concrete is being vibrated by a vibrating unit mounted directly upon the screed, and revolving 4,800 r.p.m. in a horizontal direction. A strikeoff is carried on the rear of the machine which cuts off any excess concrete to the required height. A feature of the vibrating screed, is a series of paddles distributed across the front of the



International Pressure-Vibrating Screed in Operation

screed and extending underneath the bottom, which imparts the vibrations to the entire mass of concrete being placed, the paddles being adjustable vertically to the desired depth. The vibrating unit is driven, through V-belts, by an air-cooled gasoline engine, mounted in a spring saddle, which absorbs the vibrations. Units are also available with either A. C. or D. C. electric motor drives.

Non-Tilting Mixer

A streamlined 5-S concrete mixer was placed on the market by the Ransome Concrete Machinery Co., Dunellen, N. J. It is of the end discharge, non-tilting design and is supplied with either pneumatic or steel wheels. It is also obtainable with either power loader or with low charging platform without power loader. The skip is speedy and raises to 50-degree slope. Skip shaker with adjustable stroke. Automatic knockout and brake. The water tank is of the vertical spiral cut-off type with a capacity of 8 gals. It is supplied with the well-known Ransome non-bypassing poppet valve. The mixer is driven by a 5.2 HP. (at 1,400 r.p.m.) air-cooled Wisconsin gasoline engine.

Finishing Machine

A flex-plane gas electric vibratory finishing machine brought out by the Flexible Joint Road Machine Co., Warren, O., is illustrated. This machine is equipped with reciprocating vibrated 20 in. screed, which can also be equipped with a vibrated tube. The machine finishes concrete as low as $\frac{1}{4}$ in. slump. It is adjustable for full width construction—from 18 to 24 ft., and for half width construction—10 to 14 ft. The traction on this machine is operated independently by a motor on each



Flex-Plane Gas-Electric Vibratory Finishing Machine

truck and the screed is operated by an electric motor, giving various number of speeds to coincide with the traction travel of the machine. It is equipped with finger tip control switches.

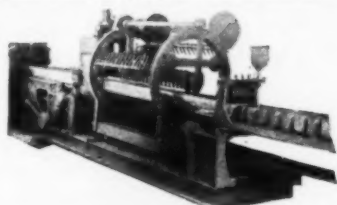
Bulk Cement Container

A new means of batch hauling and dumping bulk cement for construction work was provided by a cement bag offered by the Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa. This bulk cement container has a capacity of eight standard bags. It is made of heavy canvas, rubberized on both sides to form a weatherproof material, and reinforced as well as multiple-sewed at points of strain or wear. The reinforced hem at the closed end is constructed for bolting to the partition board of the hauling truck. The other end is open and equipped with flap covers. After loading, the end flaps are folded and the weight of the cement press-



Bulk Cement Container in Truck Compartment

ing against the aggregates seals the bag. During transportation, the loaded bag lies on top of the sand and stone batch in the truck compartment, as shown in the illustration, and travels to the mixer in that position. Both loading and dumping are said to be made easy by the flap construction. When dumping batches into the paver skip, the flow of the aggregates releases the pressure on the folded flaps. The action of gravity then opens the cement bag automatically, and the cement flows into the skip together with the sand and stone.



*Greater Uniformity
... May Be
Pre-inspected*

ONLY BRICK PAVEMENTS have a traffic surface that is made in a factory under positive control. Hence a highly uniform surface. And one that can be inspected before it is put in place. Modern methods of filler application further develop its non-skid properties.

And, in addition to a maximum

degree of safety, brick offers the lowest cost per year of any pavement! More than any other modern pavement, brick is highly resistant to weather damage. Brick that have served two score years and more in severest service are being reclaimed and relaid on new bases.

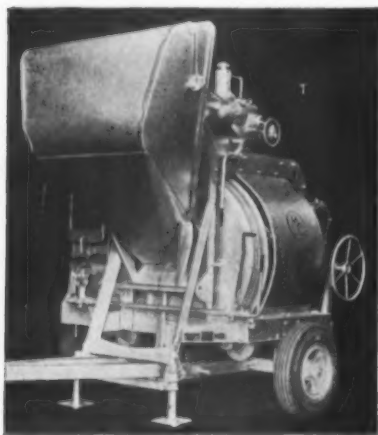
Brick pavements have the best record for low cost wear. Use on roads or streets—for new construction or resurface jobs. National Paving Brick Association, National Press Building, Washington, D. C.

BRICK

FOR NEW AND RESURFACING JOBS

New 14S Mixers

Two new 14S mixers were added to the line of the Construction Machinery Co., Waterloo, Ia. The manufacturers emphasize the use of recently developed special manganese steel and other alloys in



CMC 14S—Two-Wheeler

these machines which effect weight reduction without sacrificing long life or sturdiness.

Concrete Bucket

A concrete bucket having bottom gates that operate on the principle of a double arc clamshell, providing an automatic controlling feature for pouring into narrow forms was brought out by The Heltzel Form & Iron Co., Warren, O. The weight of the discharging concrete is concentrated



Heltzel Concrete Bucket

in the center of the bottom of the bucket and eliminates all tendency for the bucket to jump around and buck.

3½-S to 10-S Mixers

A complete new line of Rex Mixers in the 3½-S, 5-S, 7-S and 10-S sizes was announced by the Chain Belt Co., Milwaukee, Wis. The Rex 5-S is made in a 2-wheel end discharge and a 4-wheel

side discharge style and is powered by a 6 h.p. single cylinder air cooled engine. The 7-S is made in a 2-wheel end and 4-wheel side discharge model and has the optional power of a 1-cylinder air cooled or a 4-cylinder air cooled engine. The Rex 10-S mixer is made in a 2-wheel end discharge, 4-wheel end discharge, and a 4-wheel side discharge model powered by the standard or heavy duty 4-cylinder engine. All these mixers can be furnished with steel, solid rubber, or pneumatic tired wheels. All can be equipped with the new Rex batch meter and the new Rex self-priming centrifugal water pump.

COMPRESSORS AND AIR TOOLS

700 Cu. Ft. Portable Compressor

A compact diesel driven portable compressor of a capacity of 700 cu. ft. per minute was brought out last year by the Chicago Pneumatic Tool Co., 6 East 44th St., New York. The unit consists of a



Two of the New Type WO-2 Compressors on Road and Dam Project in Pennsylvania

CP Type 48 vertical, 4-cylinder, 4-cycle, medium-speed diesel engine on common crank case and crank shaft with a "V" type 2-stage, double-acting, water-cooled CP compressor, with suitable cooling systems and air receiver, all on a structural steel deck, forming a complete, self-contained portable unit. When desired, this unit can also be mounted on skids.

Drilling Machines

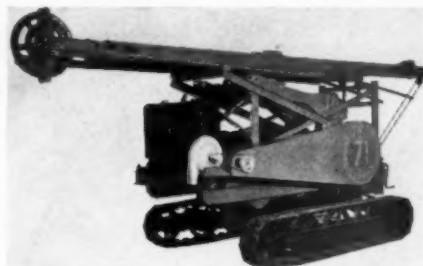
During 1938 The Star Drilling Machine Co., Akron, O., developed four new machines. These include the following:

The Star No. 73 Spudrill is an all-steel drilling machine for heavy-duty water well drilling. It is a portable, large-capacity machine, built for fast moving. This machine will drill large diameter wells to a depth of 2,000 ft., starting holes as large as 30 ins. in diameter, and will handle tools weighing up to 3,600 lbs. The No. 73 Spudrill is built in the semi-trailer model, in a full trailer model and may also be mounted on a truck.

The No. 240 Speed Star water well drilling machine, which has been on the market for many years, is now available as a combination cable tool and shot core drilling machine. It is a combination that may be quickly rigged up to handle either cable tool or shot core drilling, as the rotary table unit used for shot core drilling may be quickly attached or detached

from the machine. The water pump is mounted on the machine and the entire unit is very compact and easily carried on a 1½-ton truck.

The Star No. 75 Spudrill is an all-steel drilling machine that is readily portable



The 71 FT Star Drilling Machine

and built for high-speed moving. It is completely equipped with anti-friction bearings and has free-running wheels, air-cooled brakes and a shockless spudder. This machine will drill wells to a depth of 3,500 ft. and handle 2,000 to 4,000 lbs. of tools, depending on the depth. It is built in a semi-trailer model, full trailer model and for mounting on a truck.

The No. 71 FT Star is a drilling machine for placer and mineral prospecting. Mounted on crawler tracks, it can travel over rough ground with perfect safety. The machine is so designed that it may be moved with the mast raised in drilling position, which is a very desirable feature for mineral prospecting work.

Portable Gasoline-Powered Drill

Following exhaustive tests on actual drilling operations conducted on all types of jobs and under a wide variety of work-



Portable Gasoline-Powered Drill

ing conditions, the Barco Manufacturing Co., 1801 Winnemac Ave., Chicago, Ill., announce full time production on their newly designed, self-powered, portable driller known as the "Barco J2." The former drilling equipment manufactured by the Barco Manufacturing Co. consisted of a drilling swivel applied as an accessory tool to the Barco Hammer, but the J-2 is designed as a driller, pure and simple, incorporating the drill-turning mechanism directly in the base of the

WORLD-FAMOUS PROJECTS USE **FLEXCELL** EXPANSION JOINT

REG. U.S. PAT. OFF.

**for Durability, Resilience,
Permanence, Appearance**



Flexcell Expansion Joint used in
San Francisco-Oakland Bay Bridge.



Chicago's Outer Drive uses Flexcell
Expansion Joint.

Sidewalks, driveways, and tile roofs
of Rockefeller Center have Flexcell
Expansion Joint.

Asphalt-Impregnated Cane Fibre Never Extrudes—Never Mushrooms

ENGINEERS on such well-known projects as the San Francisco-Oakland Bay Bridge, the Chicago Outer Drive, and Rockefeller Center have found Flexcell Expansion Joint the answer to the old problem of unsightly, extruding joints.

This increasingly popular material is Celotex Cane Fibre Board, impregnated and coated with a durable protective asphalt which does not affect the air cell structure of the cane fibres. Millions of tiny air cells, retained within the board, *permit it to be compressed without extruding*—the spring-like fibres provide the resiliency which takes up the space as the concrete contracts.

Flexcell Expansion Joint is not affected by moisture, freezing, or thawing, and is protected against termites and dry rot by the exclusive, patented Ferox Process. *Years of actual use have proved its durability—that it bonds firmly to the concrete.* Conveniently installed; easily cut and punched; usable with any load transfer system. Mail the coupon for specifications.

The word Celotex is a brand name identifying a group of products marketed by The Celotex Corporation and is protected as a trademark shown elsewhere in this advertisement.



FLEXCELL

REG. U.S. PAT. OFF.

EXPANSION JOINT

ANOTHER CELOTEX PRODUCT

THE CELOTEX CORPORATION • 919 N. MICHIGAN AVE. • CHICAGO, ILLINOIS



Copyright 1939, The Celotex Corporation

THE CELOTEX CORPORATION
919 N. Michigan Ave., Chicago, Ill.

R-S 3-39

Please send complete specifications on FLEXCELL
Expansion Joint.

Name.....

Address.....

City.....

County..... State

power unit. Thus it is able to strike a full, direct blow, delivering all its power at the drill head. A ratchet wrench for turning the drill rod is standard equipment with the J-2, and, if the user desires to eliminate hand spooning or flushing of the hole, a small portable air compressor unit, necessary storage tank and fittings, is available.

Improved Clay and Trench Diggers

Two new portable pneumatic diggers, known as the Thor No. 412 and 432, were added to the line of the Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill.

These diggers are light and medium weight tools, respectively, and they can be used in any sort of ground for digging clay, hard-pan, frozen ground, etc. One of the outstanding features of these tools is the new Thor pigtail bumper. This is a spiral bumper that fits around the shank of the spade as well as inside the retainer body. Any pressure on this pigtail bumper causes it and outside diameters to hug the inside so closely that it positively excludes dirt and grit. This eliminates excessive wear on parts in the barrel and nozzle. In addition, the pigtail bumper acts to absorb the vibration of the blow from the collar on the spade, making these Thor diggers smooth-running tools.



Thor Clay Digger

Portable Compressors

Three new light-weight models in the Ingersoll-Rand line of air-cooled portable compressors were brought out by the Ingersoll-Rand Co., 11 Broadway, New York City. The smallest of these, the model 55, delivers 55 cu. ft. of air per minute at 80-lb. pressure. The next larger, the Model 85A, delivers 85 cu. ft. of air per minute at 100-lb. pressure. The largest of the three new models, the 105-A, is rated at 105 cu. ft. of air per minute at 100-lb. pressure. These three newly styled light-weight mountings are designed for balance of weight and rigid construction



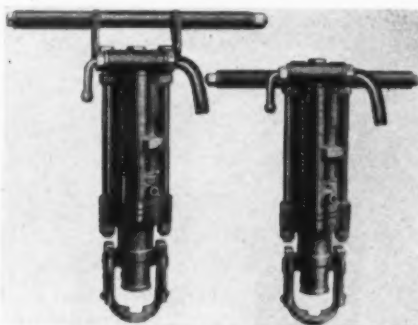
The New Ingersoll-Rand Light Weight Portable Compressors. Left to Right—Models 105-A, 85-A and 55.

throughout, permitting towing at speeds up to 35 miles per hour. Leaf-type spring mountings carry the machine on the running gear. Timken roller-bearing wheels

are furnished with either pneumatic or solid rubber tires. Covers are hinged in the manner conventional for the engine hood of an automobile. Tool boxes are built into the mounting. Air receiver and fuel tank are built end to end in the Models 85A and 105-A for greater compactness and accessibility. Models 85-A and 105-A incorporate the I-R two-stage, air-cooled compressor and are furnished with either gasoline or oil engine. The Model 55 compressor (3-cylinder) is single-stage, air-cooled and driven by a gasoline engine.

Drilling Equipment

During the past year The Cleveland Rock Drill Co., Cleveland, O., brought out a new hand sinker, a clay digger, and added another exclusive feature to its DR8

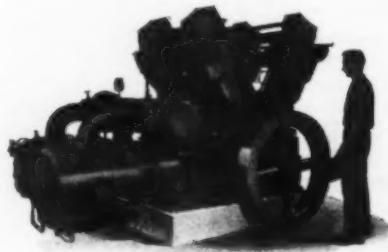


Model H10, Showing Both Types of Handles Which Can Be Supplied

drill rig. This feature is a mechanism known as a "recoil device," whose function is to minimize the rebound of the drill. It is claimed that drilling speed is thus greatly increased. The hand sinker, Model H10 is a 45-lb. drill.

Heavy Duty Compressor

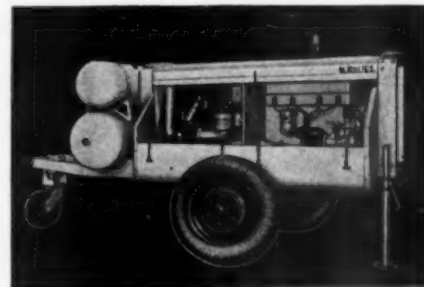
A heavy-duty Diesel-engine-driven compressor, known as the "XVO", was announced by the Ingersoll-Rand Co., 11 Broadway, New York City. The "XVO" is entirely new in design and combines a horizontal heavy-duty double-acting compressor with a heavy-duty "V" type 4-cycle Diesel engine in a single compact and comparatively light-weight unit which operates at a moderate speed. Sizes are available for actual-free air delivery ratings of 625, 935, and 1250 cfm. for 100-lb. sea-level compression. In addition, a wide variety of air, gas, and ammonia compressing cylinders is available for pressures ranging from vacuum to 5000 lb. per sq. in. and higher.



New Ingersoll-Rand Heavy-Duty Diesel-Engine-Driven Compressor Type "XVO"

105 Cu. Ft. Compressor

A new 105-cu.-ft., 2-stage, gasoline driven, portable air compressor has been announced by the Le Roi Co., Milwaukee, Wis. This machine is representative of the seven models of 2-stage gasoline-driven



Le Roi 105-cu.-ft. Compressor

compressors built by Le Roi Company ranging in size from 60 to 420 cu. ft. All of these machines are powered with Le Roi heavy-duty valve-in-head engines and all wheel-mounted models are furnished with spring-mounted chassis as standard equipment.

Lightweight Jackhammer

A new jackhammer, the JA-35, was brought out last year by the Ingersoll-Rand Co., 11 Broadway, New York City. It is a lightweight yet extremely powerful drill, styled after the widely used JA-45 and JA-55. It is claimed to do a surprising amount of work per cubic foot of air used, and also to readily handle all general light jackhammer work with ease. Weighing less than 35 lbs. it is a lightweight, easy holding, fast drilling machine that finds application in coal and metal mines, in quarries, and on construction jobs. It is light enough for cutting hitches, trimming, taking up bottom, placing trolley hangers in a mine, popholing and still powerful enough for much general work.



The JA-35

Automatic Feed Drifter Rock Drill

A new development of the Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill., was the Thor No. 90 drifter drill with a new automatic feed. The outstanding feature claimed for this is the design of the feed which uses extremely little air yet feeds the machine forward steadily to produce fast drilling in even the hardest formations. A new paving breaker, known as the Thor No. 25, was also introduced by the company. This is an exceptionally powerful machine. It is constructed with a rugged

International TD-18

TracTracTor

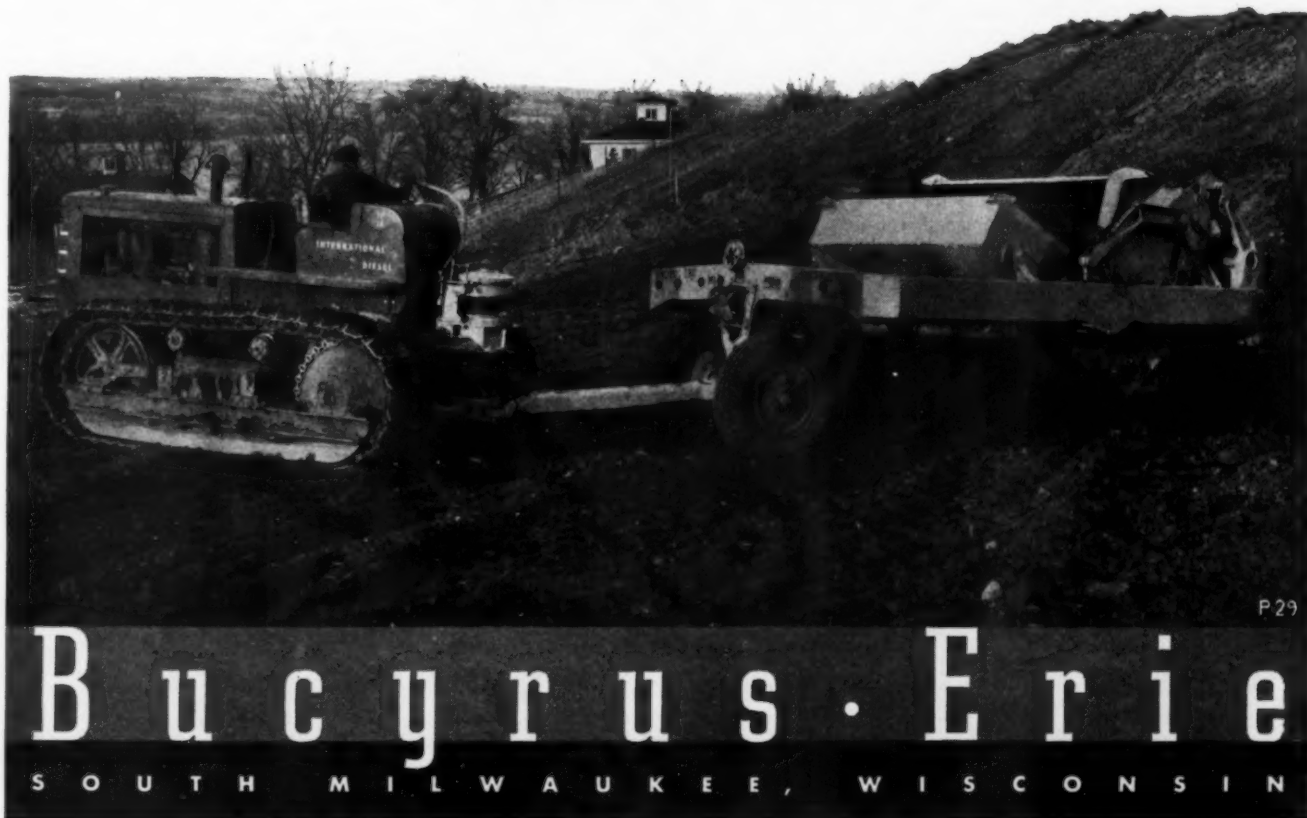
+

Bucyrus-Erie M-81

4-Wheel Scraper

=

**A new team to give you
lowest cost dirt-moving!**



four-bolt back head that enables it to withstand the most severe type of service.



Thor No. 90 Automatic Feed Drifter Rock Drill

▼ Stopehamer

A new hand rotated stoper known as the SA-90 was put on the market by Ingersoll-Rand Co., 11 Broadway, New York City. This machine embodies several new features of design. The piston is similar in outward appearance to that customarily used in jackhammers and drifters. It is solid except for the water tube hole and combines the advantage of long wearing surfaces of the jackhammer type piston with the rugged resistance to breakage of the so-called block type piston. The throttle valve is a radical departure in rock drill design. It consists of two circular plates held together by air pressure. This is one of the advantages claimed for the taper type throttle. At the same time this SA-90 throttle retains the ease of operation of the straight throttle. The large wearing surfaces materially increase the life of this part. The front-head is of the shrouded type overlapping the cylinder and increasing the rigidity of the drill at this point. The entire front end of the drill, including front cylinder washer, is equipped with easily and quickly renewable bushings on all wearing surfaces. The new, double opening, direct flow main valve is claimed to be responsible for the low air consumption and high drilling speed of this stoper.



SA Stoper

▼ Semi-Portable and Portable Compressor

A compressor delivering 425 cu. ft. of air per minute (actual) at 100 lb. was brought out by Ingersoll-Rand Co., 11



I-R Model 425 Mounted on Steel Skids (Steel Wheel Mounting Is Available)

Broadway, New York City. Known as the Model 425, it is a self-contained compressor-plant, available in portable or semi-portable mountings. A 4-cylinder, heavy-duty tractor-type engine drives the compressor through simple reduction gears. Either gasoline, gas or oil engines can be furnished.

▼ Backfill Tamper

A new Thor No. 6 backfill tamper brought out by the Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill., employs a new type rocker valve and a direct exhaust to provide a smooth-running tool with a rapid, powerful blow. It is claimed it will ram the dirt hard and put the fill firmly into place, making it unnecessary to come back to a



Thor No. 6 Backfill Tamper

job several times and backfill. As a result, paving can be done immediately after tamping. The No. 60 lifts and carries its own weight and does not tire the operator.

▼ JOINT ASSEMBLIES AND FILLERS

Shop Fabricated Road Joint

A new road joint has been developed by Bethlehem Steel Co., Bethlehem, Pa. It is a distinctive doweling unit, completely shop fabricated and ready to be sent to the job for easy and accurate assembly with prepared expansion material to form transverse joints in a concrete pavement. The Bethlehem dowel is tubular, made of sheet steel, essentially triangular in cross section. It is capped to allow expansion movement and bears directly on the ground for its full length, which gives it exceptional stability and protection against displacement during construction. These dowels are combined in units of length to fit specified pavement width and are welded to three spacing rods so arranged that the dowels are held securely in cor-



New Shop Fabricated Road Joint

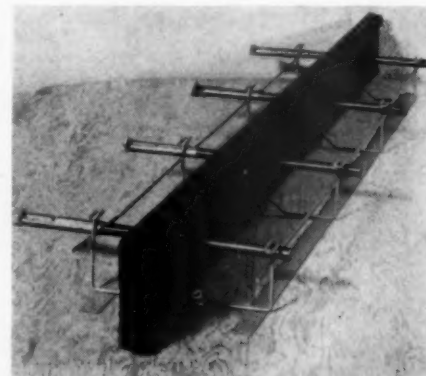
rect parallel relation. The full unit is strongly trussed in two essential directions, assuring straight joints, properly conforming to subgrade profile. Bethlehem road joints are quickly and strongly set in place by ordinary labor. Staking is done with ordinary pins; installing caps or bulkheads are used. Special features are confined wholly to the doweling detail, joints being treated for surface finish and sealing exactly as with ordinary bar dowels.

▼ Rubber Compound for Sealing Expansion Joints and Cracks

A thermoplastic rubber compound for sealing expansion joints and cracks in existing pavements and structures was announced by Rubber Associates, Inc., 1790 Broadway, New York. The outstanding feature claimed for this new product are its elasticity and adhesion at low temperatures and non-extrusion at elevated temperatures. It is miscible with bituminous materials, making it unnecessary to remove all of the previous filler in cracks and joints requiring refilling. The material is easily handled, being packed in 40 lb. cores ready for heating. The usual asphalt kettle is used to heat the material to 400-425° F., pouring viscosity.

▼ Road Joint Assembly

A new road joint assembly unit was brought out by the Union Steel Products Co., Albion, Mich. These units are used to assemble all joint materials at a central plant for distribution along the side of the work at the joints. With this unit the



Union Assembly Unit

NEWLY BUILT STATE ROADS NEED REPAIR

'Cheap' Highways Break
Up After Brief Use in
Various Rural Areas.
Maintenance is Costly

HIGHWAYS ARE CLOSED TO TRAFFIC OVER 6 TONS

Notices have been received from the state highway department that the Norwich-Plymouth highway from the city line to

corners, a distance of 10 miles, is closed to traffic over 6 tons. The highway is in poor condition and is a danger to the public.

SPRING FINDS STATE ROADS IN POOR REPAIR

Severe Winter Caused
Much Damage and
Funds Are Low

Let it
THAW!
Let it
RAIN!



CONCRETE'S RESISTANCE TO "SPRING BREAK-UPS" IS WORTH MILLIONS TO TAXPAYERS EVERY YEAR

WHEN the frost comes out or the rain pours down, concrete's sterling value becomes outstanding because softened subgrades *hold no terrors for concrete.*

Even though the past winter in some localities has not been severe, spring thaws or rains are again putting thousands of miles of roads to a test. And concrete is again proving it can stand the gaff without heavy maintenance and costly rebuilding. For concrete's beam strength bridges over soft subgrades, distributes the loads and so keeps the pressure on weakened sub-

grades within safe limits. Even after being subjected to severe frost heaving and continuous traffic over badly softened subgrades, routine inexpensive maintenance quickly puts concrete in prime condition for heavy summer traffic.

There is little or no interruption of service. Annoying detours and costly delays are avoided. Concrete is safe, economical, usable, in all seasons, rain or shine, day or night.

Drive your roads this spring and compare. Then build your new roads with dependable all-season concrete.

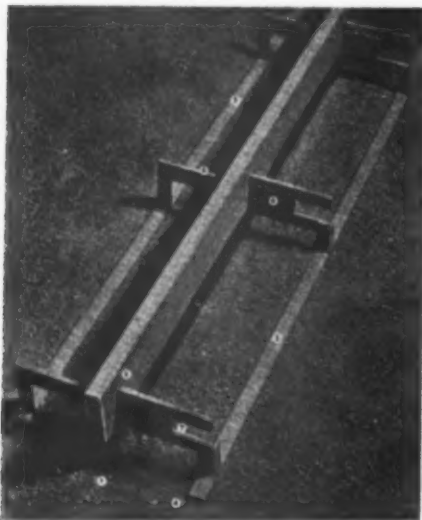
PORTLAND CEMENT ASSOCIATION

Dept. A3-28, 33 West Grand Avenue, Chicago, Ill.

dowel bars are locked in a parallel and normal position and the bottom of the filler centered to insure proper projection of the dowel on each side of the joint. After the dowels are snapped in place under the patented locking mechanism, it is stated that it is not possible for handling or job usage to dislodge them from their position.

Joint Assembly

A self-aligning expansion joint assembly was introduced by W. S. Godwin Co., Inc., Batlimore, Md. These complete rigid joint assemblies are shipped ready to place



Godwin Self-Aligning Expansion Joint Assembly

on the subgrade. The contractor simply drives the edges of the parallel supports into the subgrade and places the concrete, it is claimed.

Expansion Joints

An expansion joint, a cane fiber-asphalt product, which it is claimed will not mushroom, has been made nationally available by The Celotex Corporation, Chicago, Ill. Tiny air cells confined by wiry cane fibers are stated to give this Flexcell expansion joint its characteristic non-extruding properties. The product is made from long spring-like fibers of cane, felted into a strong resilient cellular board in which the fibers are saturated with an asphaltic compound. The air cells throughout the board absorb the compression caused by expanding adjacent concrete slabs without displacement of the material. The natural resiliency of the cane fiber springs the board back into shape when compression is released. The compression and resilient qualities are stated to provide a permanent joint filler, which remains in place due to its adhesion to the concrete and makes a tight fitting joint which prevents the infiltration of inert materials. Readily cut and fabricated, Flexcell may be used with any type of joint load transfer device. Its inherent structural strength makes for easy and quick installation. The product is not affected by extreme climatic temperatures, so that it may be conveniently handled

under all working conditions. Light in weight, Flexcell is easily cut, can be stored on the job indefinitely without losing its form or shape and gives a neat finished joint requiring no trimming after the job is completed.

TRUCKS, TRAILERS AND TRUCK EQUIPMENT

Maintenance Truck

At Annual Convention and Highway Exhibit of the American Road Builders' Association on March 7 to 10, two new FWD units will be exhibited by The Four Wheel Drive Auto Co., Clintonville, Wis. Incorporating many refinements and improvements, the Model HG is designed especially for road maintenance, and the Model T-32 for semi-trailer service in the commercial hauling field.

Aside from road blading and grading, Model HG is stated to serve every purpose as a truck, and also is suited for snow removal service. The HG is now powered with a 6-cylinder, 91 HP. engine. A straight frame 7 in. x 3 in. x 11/32 in. is now used in the chassis. The New HG is also supplied with larger brake drums. Drums on the front wheels are 16 in. x 2 1/4 in., and 16 in. x 3 1/2 in. on the rear wheels. Exceptionally rugged driving mechanism, accommodating continuous operation in its lower gears, includes a 14-in. single plate clutch and an oversize 5-speed transmission and transfer case. With the motor operating at governed speed, the unit has a low-gear road speed of approximately four miles per hour and a high-gear speed of 33 miles per hour. The unit is equipped with 7.50 x 20-in.



Model HG FWD Truck

tires (duals rear), and has a chassis weight of 6,530 lbs. Featured on the unit is a new type of underbody blade, held in constant cutting position and under constant control by levelizers and the action of hydraulic rams. All controls are conveniently located in the cab and afford the driver-operator instantaneous control of the unit.

Truck Patrol

A hydraulic truck patrol was brought out by the Hi-Way Service Corporation, 3841 W. Wisconsin Ave., Milwaukee, Wis. One of the advantages claimed is the ease in changing the cutting angle of the blade without the driver leaving his seat. The 12-foot curved moldboard has a 3/4-in. x 6-in. standard cutting edge (1-in. special on 5-ton or larger trucks). It has an 8-in. pitch adjustment and is quickly detach-

able. Two double acting rams control the up and down movement of the moldboard, while one ram is used for reversing it to

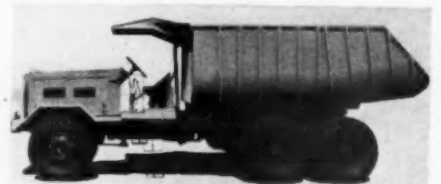


Drott Hydraulic Truck Patrol

the angle desired. The truck patrol also has ball-bearing mounted chatter eliminator rollers, 8 ins. wide, 12 ins. in diameter and of all steel construction with spring pressure tension. One feature is that the same hydraulic equipment which operates the truck patrol can also be used to operate a snow plow—thus leaving the truck available for both summer and winter work.

Trucks

Three heavy duty chain drive models were added by The Hug Co., Highland, Ill., to its line of Roadbuilder trucks. These models are: 98-CD, 98-MB and 98-MA. The Model 98-CD is a single rear axle chain drive model with a maximum gross vehicle weight of 60,000 lbs., and comes equipped as standard equipment with a 10-12-yd. Boulder Dam type body. The Model 98-MB is a dual chain drive rear axle model with a gross vehicle weight of 72,000 lbs., and the standard body equipment consists of a 16-yd. Boulder Dam type body. The Model 99-MA also is a dual rear axle chain drive model, has a maximum gross vehicle weight of 120,000 lbs., and comes equipped with a 25-yd. Boulder Dam type body. The chain drive units furnished in these models are the Maxi chain drive units built by Six Wheels, Inc., Los Angeles, Calif. The chain drive models are all built and designed for extra heavy duty service and incorporate special features of Hug design such as the all-welded I-beam frame, front axle rocker action, set-back wheel design and heavy duty armored cowl, hood and radiator guard. Air brake equipment



Model 98-MB Hug Chain Drive 72,000-lb. Gross Vehicle Weight

on all wheels is standard equipment and bucket type seat is standard with closed steel cab as optional equipment at extra cost.



ADD AN
Extra Lifetime
TO CONCRETE HIGHWAYS

CONCRETE highways last longer, stay smoother and cost less to maintain when they are reinforced with wire fabric. For the interlaced wires of steel bind the concrete together and help prevent cracking. Should cracks appear, their spreading is definitely retarded by the wire fabric.

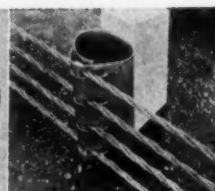
Construction men have found that the application of wire fabric is quick, simple and trouble-free. No skilled labor or special tools are

required for installation.

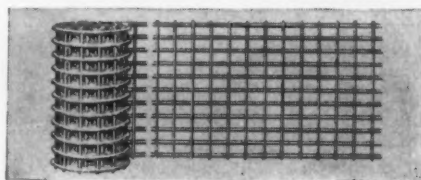
U-S-S WIRE FABRIC is made of high-yield-point cold drawn steel. The wires are closely spaced to provide uniform stress distribution. Available for quick delivery in either sheets or rolls—in Electric Welded Rectangular or Square Mesh and in Triangle Mesh. Write us for further information. Our engineers will be glad to show you how U-S-S Wire Fabric can add an extra lifetime to your concrete highways.



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Columbia Steel Company, San Francisco, Pacific Coast Distributors • United States Steel Products Company, New York, Export Distributors

UNITED STATES STEEL

Special Tires for Graders and Scrapers

Six new lines of supertraction Silver-town tires, each designed to meet the requirements of a particular kind of operation, were developed last year by the B. F. Goodrich Co., Akron, O. These lines include Truck-bus tire, heavy duty tire, tractor grader tire, heavy duty tire for trailers, and a pneumatic tire for wheelbarrows. The tractor grader super traction tire was designed to give the maximum traction required for this kind of service. Tread flexibility of these new tires is an important factor in providing a clean tread. The tread of the trailer-type super traction tires for free rolling wheels on scraper wagons and other heavy duty earth-moving equipment, is designed to provide maximum flotation. At the same time the absence of a deep tread design offers maximum resistance to cutting and side slippage.



Tire for Graders and Road Maintainers

Trailers

Several trailers of interest to the construction industry were produced last year by The Trailer Co. of America, Cincinnati, O. Figure 1 is a straight frame tandem Trailmobile semi-trailer with 9.75-20 dual tires, Timken axles, Lathan Besler Power application, designed for and used by the Department of Agriculture in hauling crawler tractors and similar heavy machinery loads. Figure 2 illustrates the

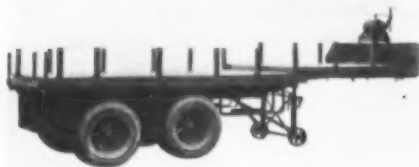


Fig. 1

double drop from trailer of essentially the same construction as Fig. 1, with lower loading height and entire load to be car-



Fig. 3

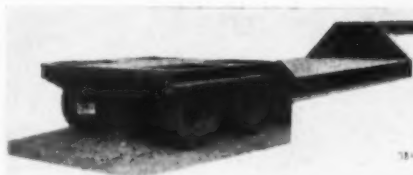


Fig. 2

ried in center of trailer. Figure 3 shows a Trailmobile semi-trailer carrying a 35-ton load. All the heavy hauling of trees, building equipment, in the Golden Gate International Exposition, San Francisco, was hauled through the city streets with the aid of a fleet of trailers of this type designed by The Trailer Company of America. The capacity load illustrated includes approximately 30 tons of tree and five tons of blocking and rigging material.

Hydraulic Hand Hoist Dump Body

Another dump body with exclusive Hercules features has been designed by the Hydraulic Steel Products Co., Galion, O. The new product is a hydraulic hand hoist dump body for the 1 and 1½-ton trucks. Operation is simple—the hydraulic pump forces oil into the twin cylinders



Hercules Hydraulic Hand Hoist Dump Body

which easily dumps the load. The hand-operated lever is adjustable for easy operation from vertical to front horizontal. To lower body, simply open the valve. When installed on chassis and raised to dumping angle, body rear end is above the chassis frame giving high ground clearance. The hydraulic hand hoist can also be furnished with tipping frame and without body when required. Hoist frames are built for universal mounting on all makes of 1 and 1½-ton trucks.

Tire and Tool Pack for Trucks

A dump body has been designed by the Hercules Steel Products Co., Galion, O., which provides an arrangement for carrying a spare tire and a tool pack. This is done by means of a compartment located beneath the body which houses a spare tire with rim or wheel, up to and including 8.25-20-inch tire size, etc. At present bodies of 7½, 8, and 10 ft. may be so equipped. The addition of this locker does



Hercules Tire and Tool Pack Body

not increase the mounting height of the body. Bodies equipped with tire locker also include a large compartment suitable for flares, chains, blocking, shovels, tools, etc. This large combination tire and tool pack compartment is confined entirely beneath the body across the front and extending under the rub rails. Bodies fitted with this locker are 6 ft. wide and have 8-in. rub rails. No part of the locker projects beyond the body rub rails. The body floor is well supported by structural cross members and the sides of the locker itself. The locker is supported, beneath, by the full-length body longitudinal members which, in turn, are supported—with body down—at the rear by body pivot, then by top of hoist frame, then dropping several inches the front half rests upon the outward, lower flange of hoist frame. With the new body and locker a special type hoist is required—designed and built in conjunction with the body underframe.

Air Filter

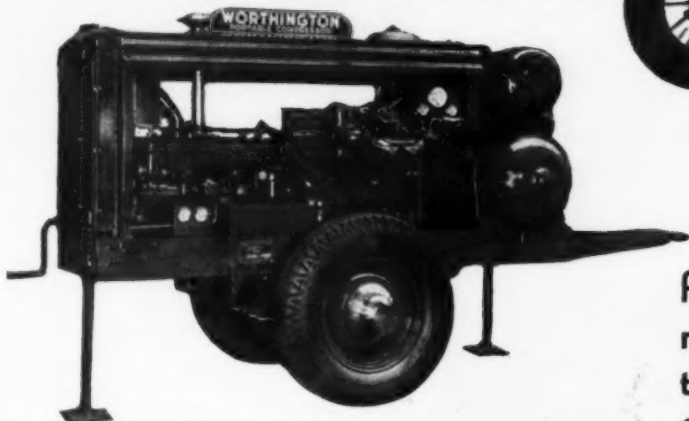
A new method of oil control in its oil bath type unit was developed by the Air-Maze Corporation, 5200 Howard Ave., Cleveland, O., which increased the c.f.m. capacity of each particular size of air filter. In other words, where previously a filter had a range of perhaps 100-125 c.f.m. in a particular size of unit, the same unit now has a range of 100-235 c.f.m. The advantage of such a feature is seen in the fact that with such a capacity range the oil bath washing action will be constant, regardless of whether the engine or compressor to which it is applied is idling or running at top speed.

Clutch and Brake Actuator Valve

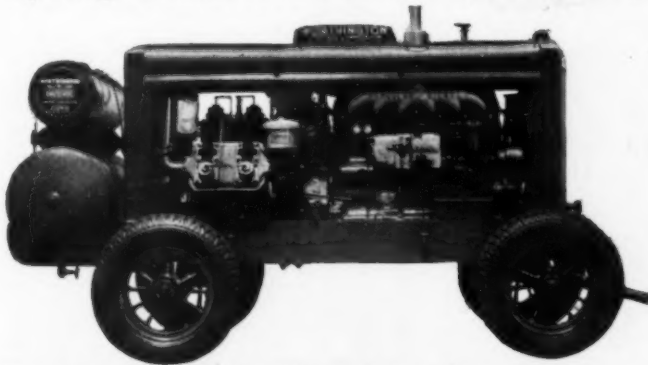
A new clutch and brake actuator valve was developed by Vickers Incorporated, 1400 Oakman Blvd., Detroit, Mich., and will be included in the Vickers exhibit at the road shows. This valve is a newly developed unit which may be used in the standardized Vickers Multiple Unit Valve Assemblies, or may be used alone, for remotely and effortlessly controlling the engagement of clutches, brakes, or other mechanisms of similar type which require



A Complete Line for EVERY TYPE OF JOB...



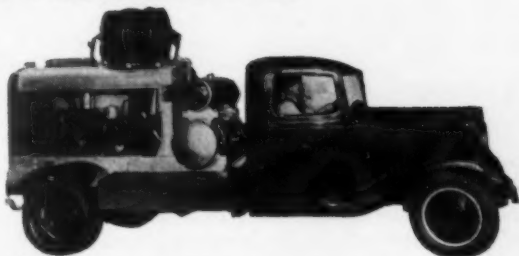
Spring Trailer...Gasoline or Diesel



Towabout with Diesel Engine Drive



**Spring Trailer...
Solid or Pneumatic Tires**



**Truck
Mounted**



**Towabout...
Steel Wheels, Solid or
Pneumatic Tires**

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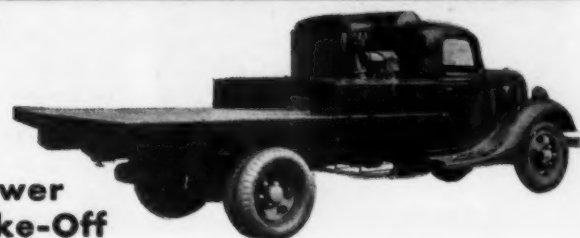


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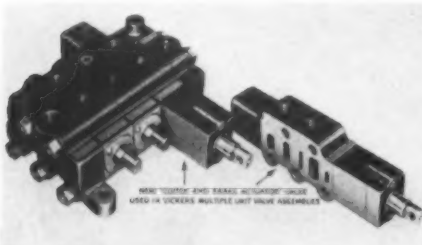
WORTHINGTON

PCB-1



**Power
Take-Off**

sensitive manual control. The valve has many new and interesting features. It may be adapted to either an accumulator pressure system or a pump pressure system. In the latter case it is so arranged that



Vickers Clutch and Brake Actuator Valve

the pump is automatically unloaded when no pressure in the system is required, but at the same time makes the operation of each valve independent of the operation of the others when more than one is used in a multiple assembly. Also, an arrangement is provided whereby a small reactionary effort in proportion to the operation effort is transmitted to the actuating lever, so that the operator can actually "feel" the engaging effort which is being applied.

Trucks

During the past year Mack Trucks, Inc., Long Island City, N. Y., announced production of three new light-capacity models the EE, EF and EG and cab-over-engine counterparts of these models, all especially suited for work in the road construction and highway maintenance fields.



Model EE Mack Truck

All of these new models have found particular favor with their employers in these fields. Their ruggedness and stamina are the same found in the heavier and more expensive Macks.

Special Marsh Truck

The 1939 line of All-Wheel-Drive Trucks, manufactured by the Marmon-



Marmon - Herrington All - Wheel - Drive Special Marsh Buggy

Herrington Co., of Indianapolis, Ind., includes a new and "special" model of the all-wheel-drive marsh buggy, first introduced last summer. Fundamentally, the marsh buggy is a Marmon-Herrington all-wheel-drive Ford truck, especially engineered to accommodate the mounting of from four to ten 13.50x24 tires. The number of these tires varies in accordance with the type of terrain in which the vehicle is to operate. For less extreme conditions single tires front and rear are furnished, but for the deeper, more difficult marshland ten tires are supplied, three on either side in the rear, and two left and two right in the front.

Bottom Dump Trac-Truk

A new model, larger capacity bottom dump trac-truk has been announced by the Euclid Road Machinery Co., Cleveland, O. The rounded capacity is 16 cu. yd.—



Euclid Model FT Bottom Dump Trac-Truk

struck capacity 13 cu. yd. The trailer body is deeper and wider at the forward end, carrying more load on the tractor drive wheels. Equal distribution of load on each of the four 18.00 x 24 tires is obtained. This permits an increased payload capacity and insures better performance where traction is limited. Another feature contributing to more efficient performance, is the high clearance under the rear of the trailer. This trac-truk is available powered with either the Cummins Diesel 6HB engine developing 150 H.P.—or the Waukesha gas GAL engine developing 133 H.P.

TRACTORS

Tractor

A new tracktype tractor, the Diesel D2, was brought out by the Caterpillar Tractor Co., Peoria, Ill. The Diesel D2 tractor has only three engine operating adjustments—the water pump, the fan belt and the valve clearance. Both the fuel injection pumps and valves are set at the factory, and require no additional field adjustment. A unique feature of the Diesel D2 engine is the twin radiator, which has been developed by "Caterpillar" engineers. One is for cooling the water and the other for cooling the lubricating oil, as oil at the proper temperature insures longer life for the engine bearings. A hot water manifold on the front side of the fuel filter housing, is an interesting all-weather feature. This keeps the Diesel fuel oil at the proper temperature, regardless of climatic conditions. Positive starting is assured by the use of a 10-HP., independent gasoline engine, which cranks the Diesel through a pinion and clutch arrangement. This is

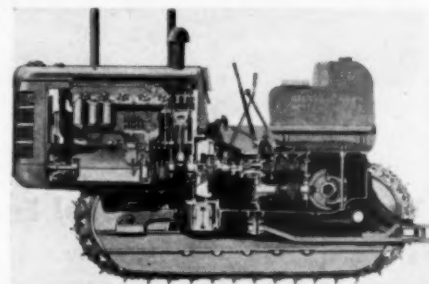
similar to the starting method used on all models of "Caterpillar" Diesel tractors.



Caterpillar Diesel D2

Tractor

The Model TD-18 Diesel 6-cylinder TracTracTor was added to the line of the International Harvester Co., Chicago, Ill. The maximum belt horsepower of the new TD-18 is approximately 80 and maximum drawbar horsepower is 70, both figures being corrected to sea level barometric pressure and temperature of 60°. As is the case with other International Diesels, the TD-18 engine is provided with a distinctive method of starting by which it starts on gasoline and, after a minute of less of operation, shifts to full Diesel operation. A conventional automotive-type electric starter is regular equipment, and with it the engine is started easily from



International TD-18 Diesel TracTracTor

the seat, regardless of weather. The tractor has six forward and two reverse speeds, as follows (miles per hour at rated engine speed): Low gear, 1½; second 2; third, 2½; fourth, 3¼; fifth, 4¾; high, 5¾; low reverse, 1½; and high reverse, 3¼. The 6-cylinder engine is of 4-cycle, full Diesel type. The tractor is 158 in. long. The overall width of the wide-tread tractor is 92 in. and of the narrow-tread, 82 in. The approximate shipping weight for the narrow-tread model is 21,500 lb. and the wide-tread model, 22,000 lb.

Twin Motor Tractor

A twin-motor tractor was brought out by The Gear Grinding Machine Co., 3901 Christopher Ave., Detroit, Mich. The new unit consists of the conventional standard Ford cab-over-engine short wheel base truck to which has been added a second engine placed immediately back of the cab. The second engine drives another set of



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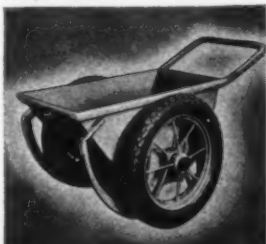
The Type K Excavator travels fast—operates fast—is easily maneuvered even in restricted space. It has ample power for emergencies—is strong and, above all, is built to *stay on the job*.

The Model "D" Dump Wagon—on many operations—moves twice the dirt at half the cost—dumps on the run—spreads dirt easily.

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Electric welded construction gives maximum strength to the Type K Excavator. Ball bearings eliminate friction and wear. Ample large factors of safety keep the excavator on the job. All attachments readily interchangeable.

Rocker Dump Hand Carts—
Pneumatic tires, roller bearings...
Easy to push... Easy to spot the
load... Dumps clean in one mo-
tion... Will not roll while in
dumping position. Made in 3 sizes:
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Round-Type Buckets. Con-
trollable center dump discharge.
Grout tight... No wearing parts
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One-half cu. yd. to 4 cu. yd. stand-
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Buckets for mass concrete.



The Model "D" Dump Wagon—truly a fit companion to the Type K Excavator in economy and dependability. Semi-trailer, bottom dump, electric door control. Adapted to any standard 1½-ton truck.

INSLEY

wheels through its own drive shaft and rear axle. A streamlined hood, harmonizing with the other sheet metal work of the unit, houses the second engine. The



Grico Twin-Motor Tractor

combined horsepower of the two 95 HP. motors is 190, with a corresponding increase in rim pull and torque. Performing alone, each motor is run by its individual controls. When the two engines are working together they provide dual operation in every respect with the exception that there is a single throttle, single gear shift lever and single brake and clutch pedals. Double compression drag of the two motors which makes for a lighter use of the vehicle's brakes, also provides greater control at all times.

Tractors

New gasoline burning Model "S" and "WS" crawler tractors were added to the line of the Allis-Chalmers Manufacturing Co., Milwaukee, Wis. This new tractor is a companion to the already popular 64 h.p. Model "S-O." Brief specifications are as follows: shipping weight, 19,000 lb., 5 speeds from 1.52 to 6.37 m.p.h. with a reverse of 1.76 m.p.h. and drawbar h.p.—64.52. The 4-cylinder valve-in-head engine of the Model "S" contains all the design features of the A-C line, a few

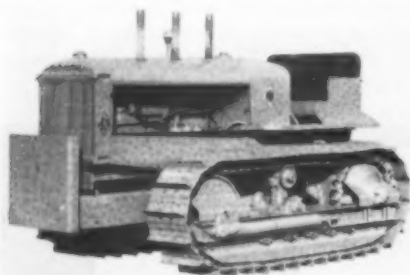


Model "S" Gas Tractor

of which are removable cylinder liners, inserted valve seats, full pressure lubrication, etc.

New Pusher Attachment for Tractors

To increase scraper yardage and reduce



Pusher Attachment for Tractors

loading time, the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has designed a front-end bumper for its Model L-O tractors to be used for pushing the tractor-scraper outfits while loading. The bumper is spring cushioned and mounted inside the truck frames in such a manner that the push is on the rear end of the tractor. The bumper has a face, 36 in. by 32 in., so contact with the scraper bumper can be made easily and quickly without shock. Though designed primarily for use with Gar Wood scrapers, Allis-Chalmers bumper equipped tractors can be used for the loading of any big capacity scraper fitted with a rear bumper.

25 H.P. Tractor

A new 25 HP. tractor, the R2, was announced by Caterpillar Tractor Co., Peoria, Ill. Designed to operate economically under all conditions, the tractor features an engine with optional fuel systems—high



Caterpillar R2 Tractor

compression for burning gasoline, moderate for using various grades of tractor fuels. The four cylinder engine has a bore and stroke of 3 3/4 in. x 5 in. and turns at 1525 r.p.m. It has a 5-bearing crankshaft, replaceable alloy iron cylinder liners and forced feed lubrication to all working parts. The tractor is provided with a 5-speed transmission. A low gear of 1.7 m.p.h. gives a drawbar pull of 5,960 lbs. Second gear is 2.5 m.p.h.; third, 3.0 m.p.h.; fourth, 3.6 m.p.h. The high gear of 5.1 m.p.h. is designed for rapid travel from job to job, and for the lighter loads.

EXCAVATORS

Shovels, Cranes, Draglines

Among the latest developments of The Marion Steam Shovel Co., Marion, O., to furnish a series of machines to meet every material handling requirement are an improved Type 331—3/4 cu. yd. machine, the Type 342—1 cu. yd. machine which has recently been added to the line, the Type 352, an improved 1 1/4 cu. yd. machine along with the Type 362—1 1/2 cu. yd., 372—1 3/4 cu. yd., 382—2 cu. yd., 392—2 1/2 cu. yd., and the Type 38-A and 40-A draglines.

The Marion Type 331, 3/4 cu. yd. machine, is built especially for highway construction, sand and gravel pits and similar operations where a substantial machine having less than one-yard capacity is needed. It is readily converted from a shovel to pull shovel, crane, clamshell or dragline.



Type 331—3/4 Cu. Yd. Machine

The Type 352, 1 1/4 cu. yd. incorporates three outstanding developments. These new Marion features are: velvo-grip hoist and crowd clutches—direct operated for sensitive control, enabling the operator to have "feel of clutch" at all times—assure smooth handling and accurate spotting of shovel and crane loads; vacuum controlled dipper trip—with control valve mounted on the main hand lever so the operator can trip the dipper without taking his hand off the main lever. This results in speedier, easier operation; vacuum controlled rotating clutches—for ease of operation, smooth setting, positive contact. Under ordinary working conditions this new Marion has a travel speed of nearly a mile an hour. Its rotating speed is nearly four complete revolutions a minute.



Type 342—1 Cu. Yd. Machine

The Marion Type, 342, 1 cu. yd. capacity, is a versatile machine for the heavy duty requirements of the many types of industrial and construction work. The shovel is readily convertible to dragline, crane, clamshell or pull shovel. It incorporates many modern features of design and construction and is built for speedy operation.



Type 352—1 1/4 Cu. Yd. Machine

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Whether or not you are going to attend this Road Show, Littleford Bros. have shown to the men interested in black top road building and maintenance, that the array of equipment bearing the Littleford Trade Mark has been engineered to do a thorough job. Each year more and more Littleford Equipment can be seen in actual operation. It's proof that users of this equipment stick to it because they know it will do what is asked of it. If you want any detailed information on Littleford Road Equipment, stop at our Road Show Booth, or write

Littleford Bros.
454 E. Pearl Street, Cincinnati

Elevating Graders

A new improvement to the Diesel No. 48 elevating grader of the Caterpillar Tractor Co., Peoria, Ill., is the increase in power for its engine model. This machine is now powered with the company's 4600 Diesel engine of 66 brake horsepower, $4\frac{1}{4} \times 5\frac{1}{2}$ bore, and stroke, and having six cylinders. But this is only one of the improvements recently made. On both gasoline and power take-off models an arched plow beam has been provided permitting rubbish, heavy sod and other obstacles to pass under the beam, thus preventing clogging. The beam has also been increased 11 inches in length, giving it more weight.



Caterpillar Diesel No. 48 Elevating Grader

The improved models also feature lower hitches on the drawbar, providing better penetration in hard soils. Third, a ratchet lock on the belt tightening wheel which holds the carrier belt without the aid of the belt tightening chain, greatly reduces the number of adjustments. Upper carrier lift chains have been replaced with cables and pass around much larger drums that give faster carrier lift which adds to the flexibility of the machine particularly when loading into wagons.

Power Shovels and Draglines

Several new shovels and draglines were added to the line of the Bucyrus-Erie Co., South Milwaukee, Wis. These include the 20-B shovel, the 18-B shovel, the 22-B dragline, the 29-B shovel, and the Bucyrus-Monighan 3-W dragline. The 20-B as a shovel weighs 37,000 lb. It travels up to 1.96 M.P.H.; has a swing speed of $4\frac{3}{4}$ R.P.M.; 37 anti-friction



Bucyrus-Erie 18-B

bearings, automatic lubrication. It is available with gasoline, Diesel or electric powers. The 18-B is fully convertible. Gasoline, Diesel or electric power; shovel working weight of 32,200 lb.; travels up to 1.96 M.P.H.; swings $4\frac{3}{4}$ R.P.M. on hooked, conical rollers; automatic lubrication; interchangeable clutches—bands re-



Bucyrus-Erie 29-B

versible end for end. The 29-B is a 1-yd. excavator shovel with standard boom combination at 45° has maximum cutting radius of 31 ft. 6 in.; clear dumping height of 17 ft. 6 in.; working weight of 65,000 lb. Crane rating at 12 ft. radius is 31,900 lb. Electro magnet for crane is available.

$\frac{3}{4}$ -Yd. Shovel

A new $\frac{3}{4}$ yard combination shovel, dragline and crane was introduced by the Lima Locomotive Works, Incorporated, Shovel and Crane Division, Lima, Ohio. This new machine is called the Paymaster. As a



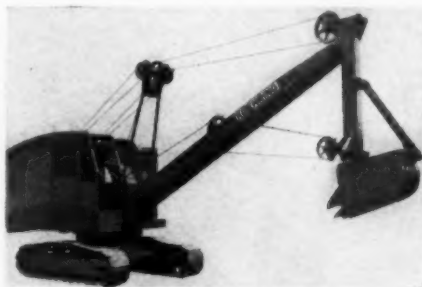
The Lima Paymaster

shovel it weighs 35,500 lbs. and is speedy with ample strength to give steady dependable service in all work suited to a machine of its capacity. When equipped as a crane, the capacity is 11 tons, but when equipped as a clamshell or dragline, capacity is determined by the length of boom and material to be handled. As a shovel, the Paymaster is equipped with an 18 ft. boom and 15 ft. dipper handle, and while the standard crane boom is 35 ft., inserts may be added to make a 50 ft. boom. Modern welded construction is a prominent feature of the unit, and the boom is of all-steel box type construction. Crawler treads are 22 in. wide, but treads may be furnished 30 in. wide when desired—all treads having six-point connections. The power take-off consists of a multiple roller chain operating in a bath of oil.

Pull Shovels

Two new sizes in pull shovels, Models 251 and 303, were developed by Koehring Co., Milwaukee, Wis. Outstanding improvements are reduction in weight,

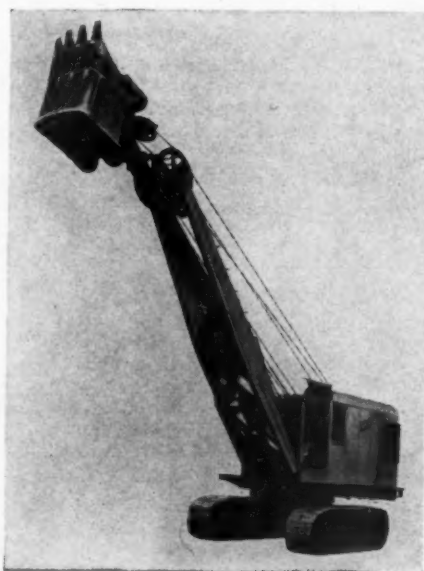
due to use of lighter but stronger steels. Longer reach with increased speed for the hoist line are important factors for greater production. Better vision, brought about improved job-frame design, affords faster operation and accurate spotting of the bucket. The dipper has been built for easy dumping. Fast swing speed eliminates loss of time from trench to dump. Enclosed gears and anti-friction bearings are additional important features of this machine.



Koehring Pull Shovel

$1\frac{1}{2}$ -Yd. Shovel

The Lorain-79, a newly designed $1\frac{1}{2}$ yd. unit convertible to shovel, crane, clamshell, dragline or backdigger service was announced by The Thew Shovel Co., Lorain, O. The new machine is mounted on a newly designed chain drive, crawler 13 ft. 8 in. long 10 ft. 6 in. wide. The crawler has two travel speeds, $1\frac{1}{2}$ M.P.H. and $\frac{3}{4}$ M.P.H., available in either direction. All the propelling and steering mechanism of the crawler is located in a central steel carbody casting or gear box. The Lorain-79, as shovel is equipped with 23 ft. boom, 18 ft. dipper stick and $1\frac{1}{2}$ yd. dipper. A special stripping boom 25 ft. long with a 25 ft. stick and $1\frac{1}{4}$ yd. dipper is available. Its capacity as a crane is 25 tons at 12 ft. radius, equipped with booms from 40 ft. up to any desired length through the medium of insertable center sections. Crane and dragline booms and equipment are also available. The backdigger boom features a 24 ft. tubular boom



Lorain-79, $1\frac{1}{2}$ Yd. Unit



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Baker Hydraulic Scrapers load easier, with less power, because they dig at a flat angle. On job after job, contractors and road officials are reporting greater yardages at lower costs. Sizes for use with 20 h.p. tractors up.

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Write today for Bulletin RS205



MICHIGAN POWER SHOVEL CO BENTON HARBOR, MICHIGAN, U.S.A.

with a 10 ft. 6 in. dipper stick. Dippers come in 31 in. to 42 in. widths and are of the controlled tilting type, whereby the operator has control of the digging angle and dumping position of the dipper at all times.

▼ ¾-Yd. Shovel

Early last year The Byers Machine Co., Ravenna, O., introduced its newly designed, lighter and faster ¾ yd. Model 83. Rolled steel construction electrically welded, and arranging machinery entirely behind the center pin greatly reduces the weight without a loss in durability. This 36,000 lb. machine, adaptable to all attachments, has



Byers Model 83 ¾ Yd. Machine

a single line pull of 11,000 lbs. at 175 ft. per minute. A 72 H.P. gas or Diesel motor provides consistent speed and power, by means of an exclusive Byers feature. This feature, common to all Byers models, is the combination of silent chain drive from motor pinion to jackshaft, and direct drive from the jackshaft direct to swing, to hoist, and to crowd-propel shafts. This is the most direct and efficient flow of power obtainable. Model 83 is the most recent model offered by The Byers Machine Co., Ravenna, O. It is one of 10 separate models offered in the four portable sizes from ¾ to ¾ yd. capacities.

▼ Stripping Shovel

A new development of 1938 of the Koehring Co., Milwaukee, Wis., is the 702 stripping shovel. This machine is furnished an extra long boom (33 ft.) and dipper stick (27 ft.) which are distinct advantages for the disposal of dirt

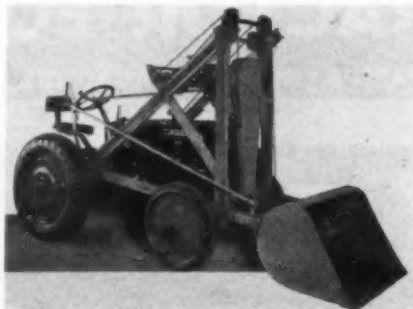


Koehring 702 Stripping Shovel

to high dump piles in stripping operations. Deep cuts are efficiently made, with a wide level floor, reducing excessive material handling. Waste material is easily deposited on high banks and pushed over the top. These new excavators are stated to be operating with great success and owner satisfaction in coal stripping operations.

▼ Tractor Shovels

Four new models of mechanically operated combination shovel attachments, for Case, Farmer's Co-op, Fordson and International tractors were announced by the Construction Equipment Co., 224 South Michigan Ave., Chicago, Ill. Extendable digging or loading and lifting arms, make it possible to dig or excavate, load, transport, backfill and hoist but with one machine, by a simple change of attachment, without disturbing the main structure. The power is taken from the front end of the crankshaft by a special hub hook-up, and transmitted through a double roller chain, to the control mechanism, mounted above the engine housing, thereby giving the attachment independent operation of the tractor movement and insuring flexibility. The standard shovel is of ½ yd. capacity, controlled with a cam latch, no fingers, on an independent lever close to the driver. The clutch and brakes are operated by one lever.



Marvel Excavator and Loader Shovel

▼ Tractor Shovel

A new overhead shovel, a tractor attachment for moving earth or loading snow, was placed on the market by Maine Steel, Inc., South Portland, Me. By the addi-



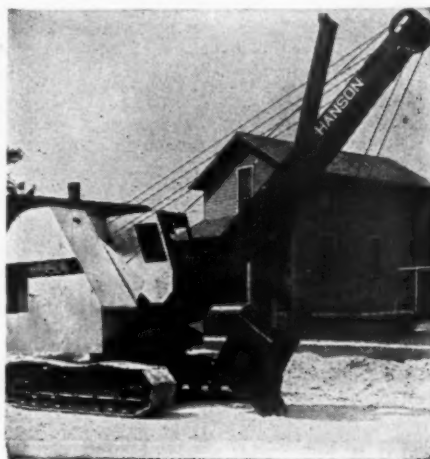
The Sargent Overhead Shovel With ¾-yd. Bucket, in Dumping Position

tion of an interchangeable group of comparatively inexpensive accessories, a standard crawler tractor, with a single operator,

has the versatility of several separate machines. In its primary shape the overhead shovel is a fast and effective dirt shovel, capable of hard digging. The smallest shovel for earth excavation is ¾ yd. Larger sizes are provided for light materials and for larger tractors.

▼ ¾-Yd. Shovel

A ¾ yd. rig, the "Comet," available in any combination of a shovel, crane, clamshell, dragline, pile driver and for trench-

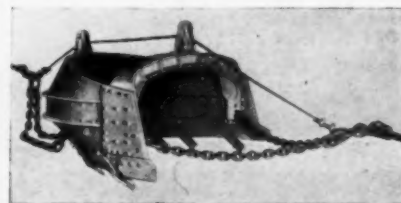


The Comet

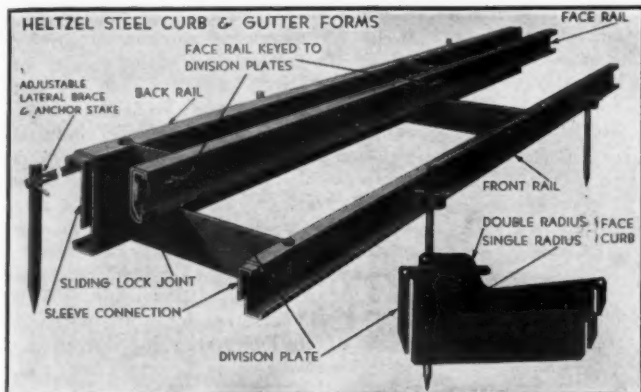
hoe was placed in production by the Hanson Excavator Works, Tiffin, O. This product is a full revolving machine mounted on an electric welded steel lower base or frame of the most sturdy and rigid design. All clutches which are Lockheed Hanson patented of the expansion double shoe type are independent hydraulic controlled (there is an automatic fluid control for each clutch and brake). The "Comet" weighs approximately 20,000 lb., is built with the same exclusive 100 per cent independent control feature as all other Hanson heavier machines from ¾ yd. to ¾ yd. in capacity. It is possible to crowd, hoist, swing, propel and raise the boom simultaneously. The "Comet" shovel is offered with either chain or cable crowd and is powered at option of the purchaser with either a Ford V-8 or Hercules 6 cylinder engine.

▼ Scraper Bucket

Sauerman Bros., Inc., 488 S. Clinton St., introduced two new models of scraper buckets during the past year, viz: a ½ cu. yd. Crescent bucket with arch type bail and a 2 cu. yd. Crescent bucket equipped with overhaul cable. Previously all small Crescent buckets have been constructed with simple pipe spreader bails and only



Two cu. yd. Sauerman Crescent Scraper Bucket Equipped with Overhaul Cable.



New Heltzel heavy duty steel forms for combined curb and gutter construction. Face form removed without disturbing front rail, back rail or division plates. Catalog S-20.

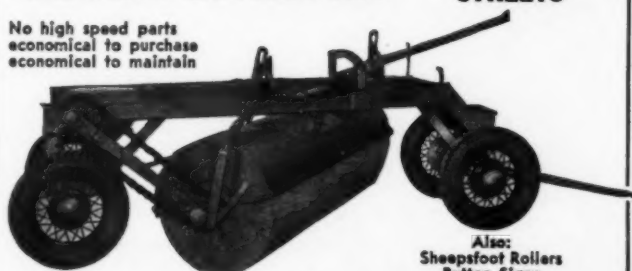
HELTZEL STEEL FORM & IRON CO
WARREN, OHIO U.S.A.

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BATCHERS (for batch trucks or truck mixers with automatic dual or beam scale)
BITUMINOUS PAVING FORMS
ROAD FORMS (with top curb and integral curb attachment)
CURB FORMS
CURB AND GUTTER FORMS
SIDEWALK FORMS
SEWER AND TUNNEL FORMS
CONCRETE BUCKETS
SUBGRADE TESTERS
SUBGRADE PLAINERS
TOOL BOXES
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GRACE SWEEPER FOR ROADS AND STREETS

No high speed parts
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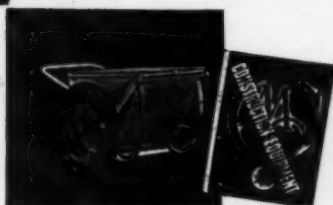
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Button Signs
Concrete Carts Tar Kettles

Made by
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1822 CHESTNUT DALLAS, TEX.



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With modern equipment for bridge and road builders. Get new catalog showing CMC Mixers—all types and sizes. Dual Prime Pumps, Hoists, Pneumatic Tired Carts, Wheelbarrows and Saw Rigs.



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THAT PUTS DOLLARS IN YOUR POCKET!

"Gluttons for work and penny pinchers on cost." Many users of Gardner-Denver WBG-315 Diesel-driven Portable Air Compressors are getting fuel oil consumption as low as 12.3 gallons of fuel oil per 8-hour shift. They are getting continuous performance . . . day after day, month after month—with shutdowns only for oil-changing purposes. They are enjoying negligible maintenance costs. They are profiting from the ability of these water-cooled compressors to work constantly under full load in any season, at any altitude.

Gardner-Denver WBG-315 Diesel Portable Compressors will give YOU thousands of hours of perfect service. And every day of operation they'll save you money in fuel costs—lubricating oil costs—in freedom from delay. For more dependable, cost-saving operation you should have complete facts and operating data about these Gardner-Denver "Portables." Write us today for full information. Gardner-Denver Company, Quincy, Illinois.



**GARDNER
- DENVER**

ANNIVERSARY
80th
YEAR

buckets of 3 cu. yd. size and over have had overhaul cables incorporated in their design. An improvement in Sauerman scraper and cableway hoists is the design of additional sizes of roller-bearing units for both scraper and cableway operation. Roller-bearing hoists now are available for operating any size of Crescent scraper from $\frac{3}{4}$ cu. yd. to 3 cu. yd. inclusive, and for any size of Sauerman slackline cableway excavator up to and including a 2 cu. yd. machine.

DISTRIBUTORS, ASPHALT PLANTS AND MAINTENANCE EQUIPMENT

Spreader and Finishing Machine

A spreader and finishing machine designed for the construction of new bituminous surfaces as well as for resurfacing work was placed on the market by the Shunk Manufacturing Co., Bucyrus, O. This spreader is simple in design and may be used with any rear dump truck. It is stated that with this unit, material may be laid from a thin mat to any desired thickness, or may be laid 1 to 3 ins. thick on one side and 3 to 6 or more ins. thick on the other side. This is made possible by the leveling adjuster. The front wheels are guided by means of a steering control hand lever and screw shafts are provided for raising or lowering the strike-off which determines further the depth of the ma-



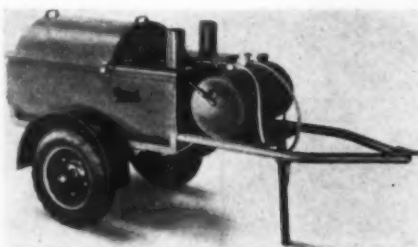
D-K Spreader and Finishing Machine

terial. A screed adjusting screw raises and lowers the oscillating screed which controls the exact thickness of the mat or material and also finishes and smooths the new surface. A floating form eliminates the need for side forms by keeping constant the width of the new surface being laid, as all material from the hopper gravitates to the ground or old surface within this form.

Tar and Asphalt Kettle

In the new "Heet-Master" kettle brought out by the Aeroil Burner Co., Inc., West New York, N. J., the heat is placed in the materials rather than under them it is stated. This new kettle is available in four models either on skids or with a pneumatic tired trailer. The oil burning unit is "sealed in" the kettle itself and the burner operates in a wind-proof, draft-proof well. The pneumatic

tired trailer is equipped with standard auto wheels and bearings, four ply tires and strong steel axles, chrome nickel leaf springs, steel shackle bolts and alemite fit-

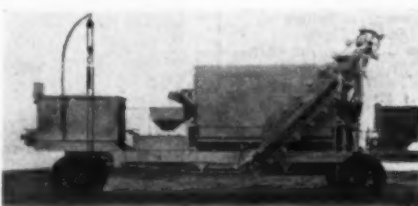


Aeroil "Heet-Master" Kettle

tings. The tow frame is made of 4 in. channel steel and reinforced with 3 in. welded steel braces. Two extra heavy, adjustable extension drop legs, one in front and one in the rear, allows for the trailer unit to be detached from the tow car and still provide a steady, non-tippable kettle.

Portable Bituminous Pavement Repair Trucks

Two new models of portable repair trucks, known as L-4 with capacity of 4 tons per hour and L-8 with capacity of 8 tons per hour, for maintenance work, were announced by the White Manufacturing Co., Elkhart, Ind. The principle of operation of these machines is the same, but there is some difference in their design. The illustration shows Model L-4 which is equipped with aggregate dryer consisting of rotating drum, 34½ in. by 6 ft., mounted on SKF bearings with internal cascading shelves. It is enclosed in asbestos lined housing and has 4 self-generating oil burners. The pug mixer is of 500 lb. batch capacity with single axle mounted on roller bearings and bottom discharge. White fireproof tar kettle of 165 gal. capacity is mounted at the front end. The cold loading bucket elevator is pivoted to swing up along side



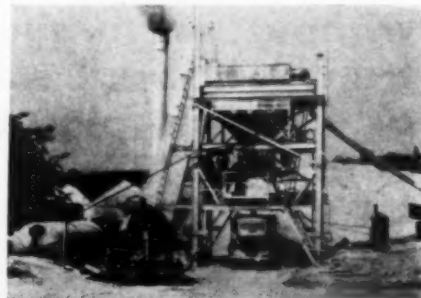
Model L-4 Portable Outfit

of the dryer when traveling. Measurement of material is by accurate volumetric hopper and graduated bitumen trough. Sixty gallon fuel tank with rotary type engine-driven pump supplies the burners. This model is powered by 2-h.p. 4 cylinder industrial gasoline engine. The chassis is steel frame, rigidly braced, with semi-elliptic springs, Timken bearing wheels and 4 pneumatic tires. Its weight is 9,000 lb. Model L-8 has a rotating dryer 36 in. by 8 ft. of the internal fired type. It is mounted on roller bearing trunnions,

has cascading shelves and center cross flight for increasing amount of steel on which the material is dried. The pug mixer has 750 lb. capacity. The tar kettle has 220 gal. capacity. Model L-8 is equipped with 32 hp. 6 cylinder industrial gasoline engine and 34 cfm. air-cooled compressor. The dryer discharge chute, mixer discharge gate and aggregate measuring hopper discharge are all air-operated. This model is also mounted on pneumatic tires with Timken wheels and semi-elliptic springs. Its weight is 12,000 lb. Both of these machines are within the limits of road clearance for operation on state highways.

Semi-portable Asphalt Plant

A new tower type 2,000 lb. semi-portable asphalt plant brought out by the Iowa Manufacturing Co., Cedar Rapids, Ia., is shown in the accompanying illustration. This plant includes a 60 in. by 20 ft. Dyer-2,000 lb. twin shaft pugmill, weigh

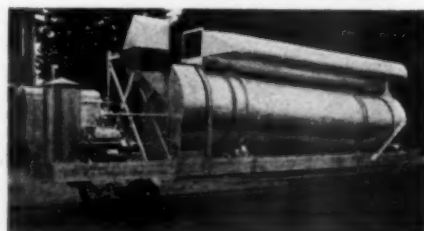


Tower Type 2,000 lb. Semi-portable Asphalt Plant

box, scales, Symons screen-hot elevator: in fact a complete asphalt plant which is available in the 2,000 lb., 3,000 lb. and 4,000 lb. sizes. These plants are also built in the portable types complete with pneumatic tires for each of the three separate units, that go to make up these plants.

Portable Aggregate Dryers

A complete line of fully portable dryers in capacities of 4, 8, 12, 25, 40 and 50 tons per hour was brought out by the White Manufacturing Co., Elkhart, Ind. These machines are all mounted on solid or pneumatic tires. All of them are of the conventional rotating drum type, equipped with oil burners. The illustration shows Model K-40, 40 ton per hour dryer with 60 in. by 20 ft. drum. Inside the drum are the conventional shelves



Model K-40 Aggregate Dryer

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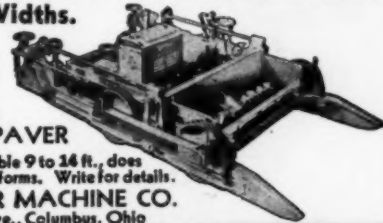
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Smoothly Spreads Stone, Macadam and Bituminous—1" to 10" of Loose Material, 8 to 11 Ft. Widths.

Lays low cost roads, faster, smoother and with real savings.

JAEGER BITUMINOUS PAVER

power-driven, adjustable 9 to 14 ft., does precision job without forms. Write for details.
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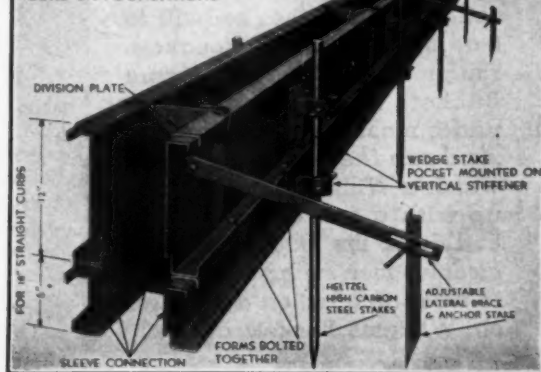
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HELTZEL STANDARD CURB FORMS
BOLTED TOGETHER FOR HIGH
CURB OR FOUNDATIONS



Utilizing Heltzel utility forms for high curb construction. Only one of the many uses described in Catalog S-20-F. Write today

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BINS, Portable and Stationary
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TRENCHING TOOLS, FOR CONCRETE

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WARREN, OHIO, U.S.A.

WILLIAMS Buckets



That's why Williams Buckets are profit producers. *Can they take it!* Man, they're built to tear into the heaviest, toughest, roughest digging. Williams Buckets stand up for years under most gruelling service. *And can they dish it out!* Just watch a Williams Bucket come up with a full capacity bite, and dump the load swiftly and cleanly—then swing back ready to wade into action again. Yes sir, Williams Buckets are truly

BUILT TO LAST

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... and if that's what you want in a bucket, you'll find your particular type in the Williams Catalog. It's free!

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Distributors located in all parts of the country represent the Williams Line of Power-Arm, Multiple Rope, Power-Wheel, Single Line, Hook-On and Dragline Buckets.

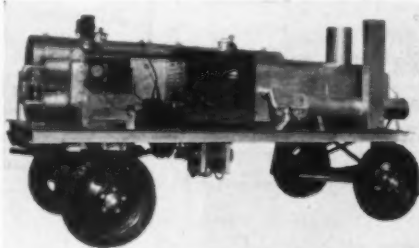
**built by
WELLMAN**



around its periphery, and in addition a centrally suspended cross flight which greatly increases the amount of area of hot steel with which the material is in contact. This unit is equipped with low pressure oil burner and stack exhaust. The use of stacks the same length as the dryer, and approximately half its diameter, eliminates the necessity for a blower. This dryer is operated by gasoline engine power plant, equipped with air compressor for the burners and 20 ft. cold bucket loader. The machine is 35 ft. long, 7½ ft. wide, 11 ft. 6 in. high and weighs 25,900 lb. The chassis is equipped with semi-elliptic springs, free rotating turn table, towing tongue with cast steel eye and rubber tires.

Tank Car Heater

A combination pumping booster and steamer was brought out by W. E. Grace Manufacturing Co., Dallas, Tex. Features claimed for this equipment include the following: Instant starting, non-clog, low pressure burners for furnace oil, fuel oil, or kerosene. Accurate, safety dial thermometer, cuts heater off at predetermined temperature. Kinney asphalt pump, 3 pumping speeds, one reverse. Positive, spiral circulation, asphalt making four



Grace Tank Car Heater

passes and traveling over 125 ft. Heat makes three passes entire length of unit.

Clogging or coking troubles practically eliminated. Low fuel consumption with rapid heating. Steam generator may be used with or independently of booster.

Mix-in-Place Road Builder

A mix-in-place machine was brought out by The Jaeger Machine Co., Columbus, O. On stabilization jobs it is stated this unit will thoroughly and uniformly mix up to 16 cu. ft. windrows at a rate of 160 to 180 tons an hour. The belt attachment at the rear of the traveling pug mill deposits the mixed material in uniform windrows, clearing the sub-base for inspection or application of tack coat.



Jaeger Mix-In-Place Road Builder

The same machine is also used to mix the bituminous top course. Where aeration of the mixed material is not required, machine can also be equipped with adjustable strike-off screed (mounted on floating 21 ft. straight edge levelers to equalize rough sub grade), which spreads the material in 10 ft. lanes, ready for final rolling, all in one operation. The Mix-In-Place Road Builder shown in the photograph is at work for Peter Kiewit & Sons of Omaha, Neb., on a sand-clay-gravel stabilization job requiring approximately 5,800 tons of material per mile.

Circulating Tank Car Heater

Circulating type tank car heater were added by Wm. Bros. Boiler & Manufacturing Co., Minneapolis, Minn., as a companion line to the portable oil burning steam boilers manufactured by that company for many years. This new heater is mounted on a semi-trailer chassis or optionally on a 4-wheel trailer. On the frame is mounted a heating tank with coils, so arranged that the cold oil flows in at the cool end of the coils and emerges at the hottest point, near the adjustable air atomizing oil burner. At one side of the tank is a heavy duty water cooled motor with integral change speed transmission, connected through a chain drive to a high efficiency road oil circulating pump. At the top of the tank is a 3-way valve for directing flow either to tank car or elsewhere. The usual accessories, including starting equipment for the motor, are furnished. A large oil supply tank is provided for the oil burner operation. This unit is made in two sizes, the larger of which is illustrated here. Owing to the

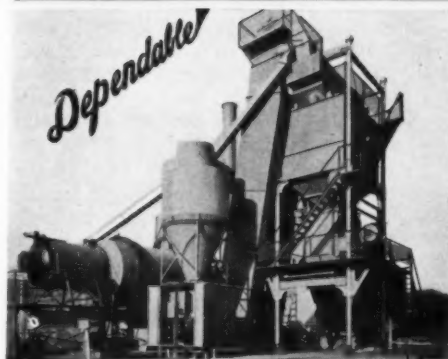


Tank Car Heater

extremely low center of gravity, this heater can be readily towed at high speed by a pick-up truck. With it, road oils may be heated very quickly to any desired temperature.



ASPHALT PLANTS



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- PORTABLE OR STATIONARY
- STEAM—ELECTRIC OR DIESEL

THE SIMPLICITY
SYSTEM COMPANY

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"GIVE ME BLAW-KNOX

Self-Aligning
ROAD FORMS
every time!

They reduce
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22

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Self Aligning **ROAD FORMS**



Paint Metal
with
EAGLE
Sublimed
BLUE LEAD
STOPS RUST CHEMICALLY

Lower cost per square foot • A gallon of Sublimed Blue Lead will cover 600 to 800 sq. ft. of metal of average smoothness. Retards corrosion chemically. Does not crack, check or scale. Good for all coats. Meets Federal and A. S. T. M. specifications. Available in paste form. May also be secured from paint manufacturers by specifying Eagle Sublimed Blue Lead mixed to painting consistency.



THE EAGLE-PICHER LEAD COMPANY
CINCINNATI, OHIO

ALL TRAILERS are NOT ALIKE!

IF you are to be completely satisfied in the operation and service of the trailer you buy, you should inspect its mechanical construction carefully. Are the beams strong enough to carry the rated capacity without sagging, after several months' service? Does it have bronze bushings on radius rods, brake cross-shafts, and all other points requiring lubrication? Does it have oversized, tapered roller bearings in all wheels? Does it include complete equipment? Those are just a few important details to look for in your next trailer.

The new 6-wheel 20-ton JAHN trailer model DHD-620 shown here is typical of the en-



tire line of **QUALITY** trailers now being built. This new heavy-duty model is convertible to a semi-trailer without any mechanical changes, by simply removing the front dolly assembly, (king pin fits any standard semi-automatic fifth wheel). Other important features include extra strength 14-in. beams, spring mounted front dolly, internal expanding vacuum brakes, and, for greater safety and longer life, these new JAHN models have more cross members than any other make of trailer.

Before you buy any trailer, check the exclusive advantages found only in JAHN SUPER-BUILT TRAILERS. Write for details.

C. R. JAHN CO.

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**Only HERCULES can offer
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A spacious, weather and theft proof compartment is built-in under body—no sacrificing pay load—no additional mounting height. Store tire, flares, shovels, tools, etc.

Center-lift principle gives super power with less effort.

A complete line of standard design hoists and dump bodies for both light and heavy duty trucks also available.



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**GILSON STREAMLINE
NON-TILT DRUM MIXERS WITH HYDRAULIC
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SMOOTHER!
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See this Streamlined Mixer at Your Equipment Distributor. Have him demonstrate the simple, safe, powerful Hydraulic Loader Construction, The Hydraulic Skip Shaker and many other construction refinements incorporated in this STREAMLINE MODEL.

Write for catalog and new low prices.

GILSON BROTHERS COMPANY
FREDONIA, WISCONSIN

Bituminous Distributor

A new distributor with turn-up folding type spray bar has been announced by E. D. Etnyre & Co., Oregon, Ill. This turn-up bar is quickly and easily interchangeable with the Etnyre full length circulating bar. Both bars are of the non-drip type and possess all of the desirable features such as raising and folding for road clearance, adjustable for height and road crown, easily and quickly lengthened or shortened. The two styles of bars are cleaned after spraying by vacu-flo system so that no material is wasted. In this new model every provision is made for the safety of the operator as well as the general public. This Etnyre Model FX Black Topper distributor not only heats and applies material rapidly, accurately and uniformly but fills its own tank with its own power; transfers material at full pump capacity from one tank to another; circulates material in its own tank or storage tank for heating; in short, performs every operation to which a distributor is adaptable.

**EXPANSION JOINTS
Made Easy**

Union Road Joint and Dowel Assembly. ONE-PIECE.

Dowels Accurately Positioned and Locked Parallel.



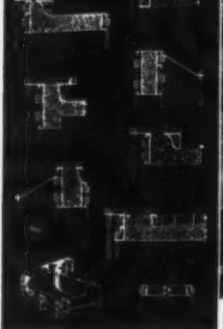
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THESE SMALL JOBS?"**



Why—I have a set of **BLAW-KNOX STEEL FORMS** which will build most any cross section I bid on.

Steel gives a nice, dense, smooth finish—expensive hand finishing unnecessary.

**NATURALLY MY COSTS
ARE LOW."**



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CATALOG NO. 1927

BLAW-KNOX OF BLAW-KNOX CO.
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Street and Sidewalk STEEL FORMS

JAEGER SPEEDLINE

End Discharge
MIXERS (up to 14S)

Latest compact 7S, 10S and 14S Trailers — faster, hundreds of pounds lighter, yet with machined steel tracks, long life construction thruout. Other sizes 3 1/2S to 56S, Tilt or Non-Tilt. Get new Catalog and prices.

THE JAEGER MACHINE CO.

223 Dublin Avenue
Columbus, Ohio



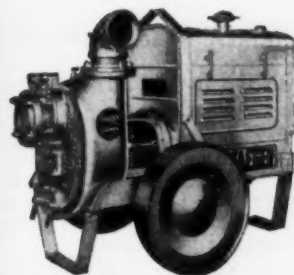
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Bantam Pump

\$8500

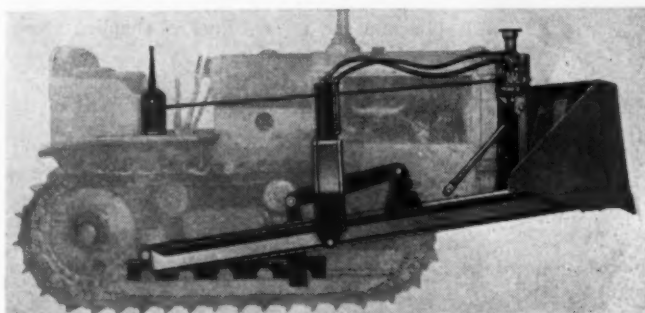
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WITH
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Prime faster, pump full volume, pump more hours. Sizes 2", 3", 4", 6", 8", 10", capacities to 220,000 G.P.H. Send for catalog. The Jaeger Machine Co., 223 Dublin Ave., Columbus, O.



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for "Caterpillar"—International
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Light but **STRONG** Easy on tractor — Moderately priced
Down pressure available—Hundreds in use
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Civic Auditorium, San Francisco, Mar. 7-8-9-10.

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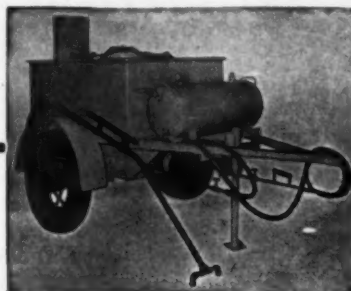
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Rebuilt Jaeger 10-13 ft. Adjustable Bitumi-
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wheels. This paver lays a beautiful job and
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FIRE PROOF—OIL BURNING
Hand and Motor driven spray.
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Elkhart **White Mfg. Co.** Indiana

GLENWAY MAXON, JR.

Mechanical Consultant

Design and Development of Con-
tractor's Equipment

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(Advertisement)

KINNEY Representatives at Booth B-43 at the Road Show

Representatives of the Kinney Mfg. Co., 3537 Washington Street, Boston, Mass., will be at Booth B-43 at the Road Show ready to point out the many advantages of Kinney Distributors to Owners, Engineers, and Operators.

To the Owner, faced with a natural desire for profitable operation, they will emphasize the alloy steel tank which reduces the "dead" weight by 500 lbs. (on the 1,000-gallon size) 1—and the economical use of materials due to the quick stopping and starting, air operated, spray control; and the accuracy of the Kinney pump as a meter.

To the Engineer, interested in accurate application, Kinney representatives will emphasize quick starting and stopping; the full spray even at the end nozzles; large-capacity Kinney pump; efficient heating unit, and tachometers.

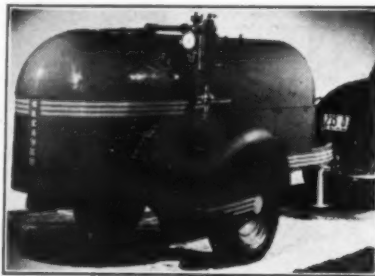
Operators will be directly interested in the safety and easy handling features: fuel tank well away from the burners; ladders, and hand rails; relief valves, vents, and the inside closing valve.

Of general interest to all, is the fact that Kinney Engineers rely on proved equipment—Westinghouse Standard Air Brake diaphragms to control spray; and Ford 60 H.P. engine for which service is universally available.

Ask for Bulletin A.

Steam Tank Car Heaters

The 1939 model steam tank car heater of the Cleaver-Brooks Co., Milwaukee, Wis., illustrates what can be done in artistic effect with even such a prosaic subject as a steam boiler. To the modern styling of the new Cleaver steam tank car heater has been added new and important savings in operation the result of many years of experience in the heating of bituminous materials in tank cars. Under the steel covering is a highly efficient, oil-burning steam generating plant of the horizontal fire tube type, especially designed for burning fuel oils. The burner atomizes the fuel and a gasoline driven blower furnishes the correct amount of air at the correct pressure to provide complete combustion.



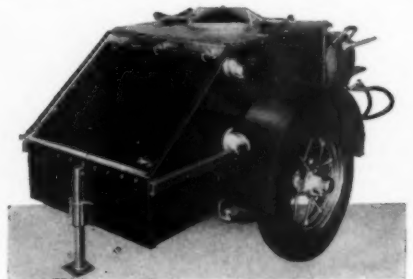
1939 Model Cleaver Steam Car Heater

The gases are then forced four times downward through a long gas travel, resulting in a highly efficient unit. Insulation is furnished around the boiler shell,

to prevent heat losses and over this is the streamlined sheet steel lagging. The oil burner and other operating machinery is also covered by sheet steel housing. The unit is self-contained and is mounted on a high speed, roller bearing, rubber tired trailer for quickly moving from one location to another.

Tool Heater-Tar Kettle

Construction and repair work on bituminous pavements usually requires the use of an asphalt or tar heating kettle, and also means for heating tampers and smoothing irons. A combination unit, removing the necessity for two separate outfits was announced by the White Manufacturing Co., Elkhart, Ind. This combination tool heater-tar kettle consists of a 50 gallon kettle with the fireproof top and automatic overflow, together with a tool heating space 32 by 55 in. Two oil burners furnish the heat for both the kettle and the tools. Fuel is supplied from



Combination Tool Heater—Tar Kettle

20 gal. detachable tank with hand air pump. This trailer is mounted on semi-elliptic springs, Timken bearing wheels and 6.00 by 16 pneumatic tires. Its weight is 1,000 lb.

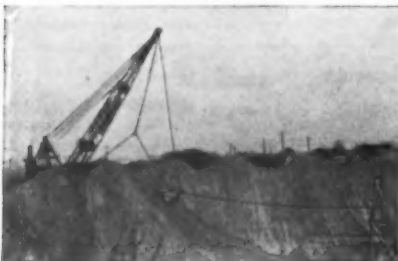
Heater for Bituminous Material

New equipment developed by the Cleaver-Brooks Co., Milwaukee, Wis., includes a unit in which its pumping booster is connected with a storage tank containing road oils, asphalts, etc. The booster assembly is made up of engine-driven pump, oil-fired heater with necessary valves and piping, all mounted under the storage tank. Two sizes have capacities to handle 1,000 and 2,000 gal. of bituminous material per hour heated from atmospheric to application temperatures—350-400° F. if required. The heating unit is a 4-pass, down-draft floating head element having a built-in flow equalizer and assembled in a shell equipped with handhole openings for cleaning and inspection. This unit connects to the storage tank by means of a 12 in. gate valve. Heat is supplied by an oil burner, motor or engine-driven. The burner assembly includes a fuel pump, pressure regulator, strainer, and pressure gauge. The bituminous pump is a 3 in. jacketed Kinney asphalt handling unit, chain connected to a 15 H.P., 4-cylinder LeRoi gasoline engine. Three-way flow cocks are assembled in the suction and discharge lines and there is a thermometer in the circulating line. The storage tank is available in size to specification for heating storage material in quantities as required. For heat-

Costs Reduced ... ON TOUGH EXCAVATING JOBS



Slackline Cableway at Work in Wet Pit



Sauerman Scraper, operated by crane, digs basin 400 ft. wide for reservoir.

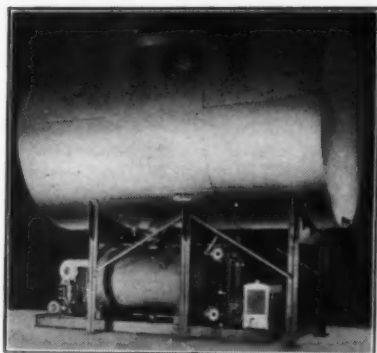
The first cost of a Sauerman Cableway or Drag Scraper machine for the average long haul job is less than the cost of any other equipment that will **dig, haul and place** an equal yardage of materials. Moreover, a Sauerman machine is easy to operate and demands little by way of repairs, assuring a minimum daily expense.

These machines have a working range of 100 to 1500 feet, and will handle from 10 to 1000 cu. yd. of material per hour; the handling capacity depending upon the material, the working span, and the size of the bucket.

Tell us what work you wish to do and we will quote on an economical machine to meet your exact requirements. Or if you require only general information concerning this type of equipment, ask for the 84-page Sauerman catalog.

SAUERMAN BROS., INC.
488 S. CLINTON ST. CHICAGO

SAUERMAN LONG RANGE MACHINES



Cleaver-Brooks Pumping Booster and Storage Tank

ing road oils no steam is required, but for heavy asphalts the storage tank is equipped with vertical and horizontal steam heating coils in removable assembly. Tank mounting is on structural steel supports equipped with saddles.

New Use for Sisalkraft

The Sisalkraft Co., 205 W. Wacker Drive, Chicago, Ill., has developed a new use for their material in the protection of windrows of aggregate on oil mat roads. For some 10 years, Sisalkraft has enjoyed wide usage as a medium for curing concrete road surfaces. It was this background and general experience which brought forth this new use. The principle involved is very simple: Sisalkraft is a tough, waterproof, airtight paper. It has the ability to keep moisture out of the windrows on which contractors spend a lot of money—drying and preparing for oiling. The blankets are 60 ft. long and wide enough to fit any sized windrow.

Trinidad Asphalts for Maintenance

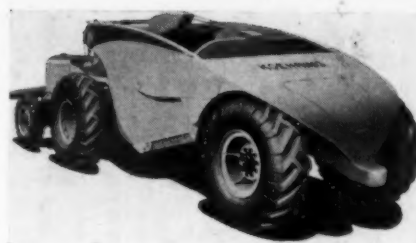
Trinidad, a pioneer asphalt in city paving in the United States, now enters the field of maintenance and low-cost construction of highways. Barber Asphalt Corporation, Barber, N. J., has recently announced the addition of several Trinidad asphaltic materials to its line of products. Several years of development in the laboratory, and practical tests in actual service have made it possible to put on the market the following materials: Trinidad blended cut-back asphalts for cold surface treatment, road-mix and cold patching. Trinidad blended liquid asphalts for hot surface treatment and light penetration construction. Trinidad road asphalts for hot penetration and cold laid mixtures (liquifier type).

SCRAPERS AND BULL-DOZERS

Scraper

One of the latest and newest units for dirt-moving is the 6½-yd. Koehring Wheeler, brought out by the Koehring Co., Milwaukee, Wis. Its principle is economically sound as it provides high speed for traveling and added power for faster loading. A crawler tractor is utilized to furnish the necessary effort for loading and only when loading. Obviously, when

power is required, speed is sacrificed. To overcome this condition, existing when crawler tractors pull the loaded unit, Koehring uses a rubber tired tractor—the Koehring Tractor—with speeds of 18 to 20 miles per hour, for traveling to and from the dump. The width and height are within highway limitations, permitting travel on any highway or city street. It has 21 in. of clearance in hauling position, yet is flat on the ground for easy loading. The short over-all length and wheel base makes possible complete turns on 20-ft. roadways. It is flexible, can travel on rough gade or smooth highways, can be used for city excavating as well as highway grading. The Koehring tractor speed can easily be synchronized with the



Koehring Tractor

crawler tractor for maximum loading effort. The push tractor, required for loading, loads a unit while others are traveling to the dump, thereby requiring only one push tractor for a fleet of Koehring



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HIGHWAY MOWER

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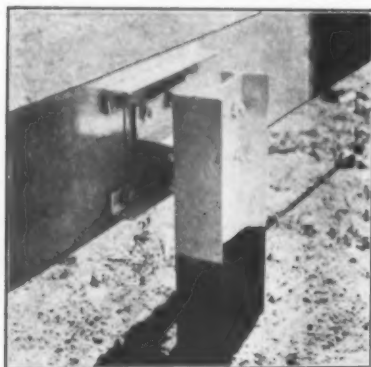


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PLYMOUTH, OHIO

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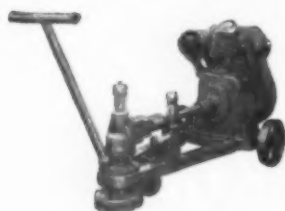
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Write for details.

THE CONCRETE
SURFACING MACHINERY CO.
CINCINNATI, OHIO

Wheeler. The Koehring tractor has been used for the Koehring trail-dump for 5 years. Wheeler units and trail-dump wagons are interchangeable for use with the Koehring tractor, quickly and easily making this hauling equipment suitable for any type of job.

Scrapers

The new Baker hydraulic scrapers of the two-wheel type with flat digging angle, were developed late in 1938 by the Baker Mfg. Co., Springfield, Ill., to include scrapers of 2½ and 5 cu. yd. capacity. Early this spring Baker will introduce an 8-yd. scraper employing the same basic features but built with four wheels. The new scrapers load easier and with less power because of the flat digging angle which permits the dirt to fill the rear of the pan first and requires less crowding to load to full capacity. Other features are the tapering pan, down pressure on cutting edge and automatic rear clearance. The last named feature provides quick rear clearance for the scraper when hauling or dumping. On the Model 190, 2½ cu. yd. scraper this is accomplished by strong springs at the rear which compress when loading and are released when dumping. On the Model 210,



5 Yd. Baker Hydraulic Scraper

5 cu. yd. scraper the same results are obtained by two rear hydraulic cylinders which operate automatically through the hydraulic system.

Self-Powered 30-Yd. Scraper

A 30-yd. self loading scraper, the Tournapull—stated to be capable of making fast truck speeds under its own power, was brought out by R. G. LeTourneau, Inc., Peoria, Ill. The unit is powered by a 160 H.P. "Caterpillar" engine, whose nose extends unsupported in front of the 80 in., 2-ft. tread pneumatic tired drive wheels.

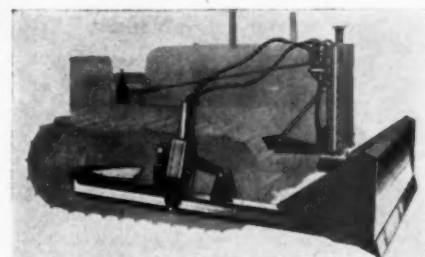


The 30-yd. Self Powered, Self-Loading Scraper

The weight of this overhanging motor is counter-balanced by the weight of the carrying unit and the load in the rear. The entire weight of the engine together with much of the weight of the load is placed on the two large drive wheels to give the greatest possible traction per pound weight. The Tournapulls are steered much like track-type tractors—by independent control of each wheel. However, they have an additional feature not found in conventional tractors. One wheel may be held stationary and the full engine power transmitted to the other. Interchangeable hauling units have been designed for the Tournapull—the Tournatrailer and the large carryall scraper. The Tournatrailer is a 30-yd. rear dump buggy consisting of a bottomless body sliding over a fixed bed. In dumping, the body—cable controlled—moves back over the bed, scraping the load with it, and drops the material through the ever widening gap at the rear. The second unit is the U-type, double bucket, 30-yd. carryall scraper adapted for Tournapull usage.

Improved Brodsozers

During 1938 the Wm. Bros Boiler & Mfg. Co., Minneapolis, Minn., placed on the market their improved Brodsozer with front mounted pump. On these the pump is driven directly from the front end of the tractor crank shaft with provision for cranking through the pump. A clutch is provided for disconnecting the pump if desired. For protection of the pump and radiator, a sturdy radiator guard is fur-



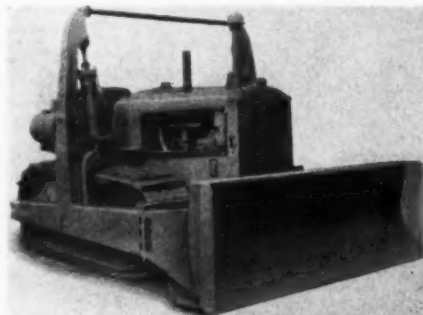
Brodsozer

nished with the dozer. Contained in the top of this as an integral part is the oil supply tank, and on one side of the tank is mounted the operating valve. A by-pass valve included in the operating valve completely unloads the pump so that the oil

cannot be heated by by-passing. Short lengths of high pressure hose serve to connect the valve with the well-known Levr-lift operating rams, which are now available either with or without down pressure. Brodsozers are available for current and non-current models of "Caterpillar," Allis-Chalmers and International Tractors.

Bulldozers

Many improvements have been made on the hydraulic bulldozers and gradebuilders of the Baker Mfg. Co., Springfield, Ill., during 1938. In 1939 we find alloy-steel models of both bulldozers and grade-builders extended to those for K and KO, in addition to those for the WK and WKO Allis-Chalmers tractors. There are new models of curved blade or excavator type bulldozers for Models M and K Allis-



*Baker Bulldozer, Excavator Type
(Curved Blade)*

Chalmers tractors. Front hydraulic pump mounting has been provided for use on bulldozers and gradebuilders for Models M and K Allis-Chalmers tractors so that they may be operated in combination with winches, hoists or other equipment.

Bull-Angledozer

A bull-angledozer was brought out by the Hi-Way Service Corporation, 3841 W. Wisconsin Ave., Milwaukee, Wis. Available for only the Allis-Chalmers line of crawler tractors, the Drott bull-angledozer, it is stated, will do shoulder sloping, ditching, leveling, bulldozing and roadbuilding work. It is power hydraulic operated, has up and down pressure, vertical angular adjustment on either side of the moldboard can be made from the driver's seat, blade can be angularly adjustable relative to the direction of travel of the tractor and can be quickly changed from angledoizing to bulldozing position.

Scrapers

Two scrapers designed for use with the International TD-18 TracTracTor were brought out by the Bucyrus-Erie Co., South



Bucyrus-Erie Scraper

Milwaukee, Wis. One of these is a 4-wheel model, the other a 2-wheel model. The 4-wheel model has an overall length including the tongue of 24 ft. 9 in. and the overall width is 9 ft. 10 in. The cutting edge length is 7 ft. 6 in. The 2-wheel model has an overall length, including tongue, of 16 ft. while the overall width is 10 ft. 8 in. The cutting edge length is 6 ft. The capacity of both models heaped to 30° is 8 cu. yd.

Scraper

The accompanying illustration shows the 1939 model of the 8-yd. tractor scraper of



8-yd. Tractor Scraper of Austin-Western

the Austin-Western Road Machinery Co., Aurora, Ill. One lever and a single drum winch on back of tractor control all digging, hauling, dumping and spreading. Bit can be raised or lowered with trigger-quick accuracy; pan fills rapidly and cutting edge is steady because rear wheels track inside of bit on firmer ground.

(The Equipment Review Section will be concluded in the April issue.)

EXHIBITORS AT ROAD SHOW

The following is a list of exhibitors and exhibits at the San Francisco Road Show, as complete as we could make it at the time of going to press:

J. A. Adams Company, Booth No. B-63. Pictorial display of entire line. Representatives in attendance: E. E. Christena, Mgr. Sales Promotion; W. R. Adams, President; H. R. Mower, Dist. Sales Mgr. Hotel headquarters: Whitcomb.

Aeroll Burner Company, Inc.—C-11. A new type of tar, pitch and asphalt heating kettle, which is heated from the inside. Operated flashing signal, Reflectostrip, Reflectoletters, Reflectosigns, Reflectobuttons. Traffic Division will display a new battery. Geo. P. Kittel, President; M. M. Yarrington, Sales Manager; R. S. Arthur, Chicago Branch Manager; Albert Hautt, San Francisco Branch; T. J. Comparte, San Francisco Branch. Hotel headquarters: Sir Frances Drake.

Allis-Chalmers Mfg. Co.—B-65. Showing of motion pictures and a general display. No equipment will be exhibited. W. A. Roberts, General Sales Manager; A. F. McGraw, Advertising and Sales Promotion Mgr.; N. B. Nelson, Mgr., Oakland Branch; M. L. Van Hercke, Western Division Mgr.; M. L. Noel, Industrial Sales Mgr.

American Manganese Steel Div.—A-9. Model Rivetless Newable Lip Power Shovel Dipper, Nickel Manganese and Hard Surfacing Welding Rods, Manganese Steel Repointer Bars for Dipper Teeth, Dragline Chain. W. M. Black, Vice President; G. Ward, Vice President; C. C. Brayton, W. C. Bruton, H. L. Morrison. Hotel headquarters: Palace.

Anthony Co., Inc.—B-19. Miniature Anthony Hydraulic Low Loading Height "OK" Hoists and Bodies, in operation. R. R. Howard, Vice President and Gen. Sales Mgr. Hotel headquarters: St. Francis.

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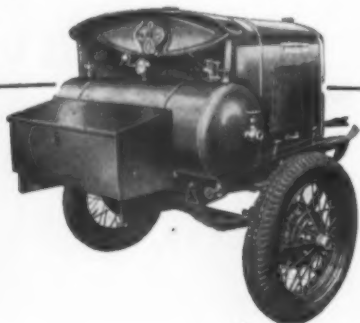


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Armco Culvert Mfg. Association—B-45. Principally working models of Armco Multi-Plate pipe and arches, perforated pipe, paved invert pipe, pipe-arch and bin-type retaining walls. S. R. Ives, W. H. Spindler, C. T. Faw, R. T. Reinhardt. Hotel headquarters: Hotel Whitcomb.

Barber-Greene Co.—B-64. B-G Tamping, Leveling Finisher and photographs and movies of Mixers, Loaders, Conveyors, etc. H. H. Barber, W. B. Greene, E. D. Stearns, E. L. Benson, E. H. Cooper, H. A. Barber, J. H. Tiller, and others. Hotel headquarters: Hotel Empire.

The Black & Decker Mfg. Co.—B-29. New "Hi-Way" Loadometers, which are Portable Scales for Weighing Trucks, and representative line of Portable Electric Tools. E. E. Powell, Mgr., Loadometer Dept.

Blaw-Knox Company—B-34. Animated display of construction equipment (B-34). Highspot of the company's exhibit will be a working model of the latest Trukmixer. Other items to be featured by Blaw-Knox Company include the self-aligning road form, steel curb form, weighing batchers and batcher plants, bulk cement plants, ready-mixed concrete plants, tamping rollers, road finishers, storage bins, clamshell and concrete buckets. Chester H. Lehman, Executive Vice President; Robert T. Harris, Manager, Construction Equipment Department; and representatives of the company's Western Dealers.

Brooks Equipment & Mfg. Co.—B-11. Sound Moving Pictures. Wallace Brooks, President; G. V. Allridge, Sales Representative. Hotel headquarters: St. Francis Hotel.

The Buda Co., Booth No. —. Buda Lanova Automotive Diesel Engine Model 6-DT-468, complete line of Hydraulics and Mechanical Jacks for Contractors, Railroads, Utilities, Mining, Trucks and Busses and Oil Field use. C. H. Bull, representative.

The Buffalo-Springfield Roller Co.—B-39. Model roller, 3-axle tandem type. W. J. Hazeltine, Sales Engineer. Spears-Wellis Machinery Co., distributors. Hotel headquarters: St. Francis Hotel.

Coffing Hoist Co.—J. R. Coffing, General Sales Manager.

Calcium Chloride Assn.—A-3. Pictures and literature. R. A. Giddings, Secretary, Calcium Chloride Assn.; John Elleman, Field Engr., Solvay Sales Corp.

J. I. Case Co., Racine, Wis.—B-22. Model "RI" Tractor, Highway Mower, and other exhibition material. G. W. Iverson, Sales Mgr., Ind. Div., Racine, Wis.; F. M. Stewart, Ind. Rep., Seattle, Wash.; P. Faurie, Ind. Rep., Oakland, Calif.; W. F. Carey, Branch Mgr., Oakland, Calif. Hotel headquarters: Empire Hotel.

Caterpillar Tractor Co.—B-67. Cutaways, picturing the working parts and principles of the Diesel Engine and a continuous showing of 1933-1939 series of Caterpillar Industrial sound film. James Fort, San Leandro office; C. O. Wold, Vice President; T. R. Farley, Asst. to President; H. H. Chambers, Western Sales Mgr., and others.

Chain Belt Co.—B-37. 160 Pumcrete, 10-S Mixer, 3 Pumps. G. K. Viall, Vice President; B. F. Devine, Sales Manager; A. E. Miller, District Manager; J. M. Reiter, District Manager. Hotel headquarters: Palace Hotel.

Chevrolet Motor Division, Booth No. —. Motor Trucks, Dump Bodies, Air Compressors, Road Maintenance Equipment, Highway Engineer Survey Cars. Personnel in charge of S. C. Vance, Oakland, Calif., Regional Truck Manager.

The Cleveland Tractor Co.—B-5. Streamlined FD Diesel 95 H.P. Tractor. Decorations with 12 large colored pictures, showing Road Building operation. H. J. Leisenheimer, Vice President; W. E. Miles, Sales Manager; D. A. Milligan, Equipmt. Engr.; L. D. Ogle, Asst. to Gen'l Sales Mgr. District men: R. G. Wallis, R. Meyer, H. W. Trittips, H. Carmody, W. G. Harmon.

Construction Machinery Co.—B-28. 1 7S Concrete Mixer, 2 $\frac{3}{4}$ S Concrete Mixers, Self-priming Centrifugal Pumps, Concrete Cart. L. S. Holden, Pres.; H. R. McDermott, Ch. Engr.; R. E. Ohler, Sales, and G. A. Loveall, Sales Mgr. Hotel headquarters: St. Francis Hotel.

Cummins Diesel Sales, Booth No. —. Diesel Engines. Chas. Lare, R. H. Willis. Hotel headquarters: Alexander Hamilton.

Diamond Iron Works, Inc., Minneapolis—C-13. No machinery will be exhibited, but the booth will be arranged so visitors can be taken care of comfortably, and new literature will be available for distribution. L. J. Reay, President; O. E. Ertl, Sales

Manager. Hotel headquarters: St. Francis Hotel.

Dimick-Mosher Products Co.—B-47. Demonstration tests and showings of the Skip-Pipe, Sloping Kradle Invert Pipe. D. B. Dimick and F. W. Mosher.

E. D. Etnyre & Co.—B-15. New Spray Bar Features. A. C. Rerick and Samuel R. Etnyre. Hotel headquarters: Empire Hotel.

Four Wheel Drive Auto Co.—B-32. Novel display of hand-colored, illuminated 30x 48-in. photographic enlargements of F.W.D. Trucks in action in diversified operation.

The Galion Iron Works & Mfg. Co.—B-38. Photographs will be exhibited. John S. Boyd, Vice President; Y. T. Leftwich, West Coast representative; John M. Gates, West Coast representative. Hotel headquarters: Palace Hotel.

Gar Wood Industries—B-33. Operating miniatures of Gar Wood hydraulic hoists and bodies, mounted on diminutive trucks, and a small scale-model of the Gar Wood hydraulic scraper, a road-building machine, will be displayed. Gar Wood miniatures will be used to demonstrate the operating and sales features of hoists and bodies and scrapers. Gar Wood, President; G. A. Bassett, Treasurer; C. D. Macpherson and President Wyman of the hoist and body division; James C. Work, General Manager, Gar Wood Pacific Coast Factory at San Francisco; and John B. Work, Gar Wood Los Angeles Branch Manager. Hotel headquarters: Hotels Empire and Whitcomb.

The Gorman-Rupp Company, Booth No. —. 3-in. and 4-in. Contractors' Pumps, 4 Models Lightweight Aluminum Pumps. J. C. Gorman, President. Hotel headquarters: Hotel Empire.

Hamilton Mfg. Co.—B-16. Drafting Tables and Accessories, Steel Plan File Equipment. R. G. E. Cornish and W. F. Norton.

The Heil Company, Booth No. —. Pictorial illustrating the various products of manufacture. These photos will show the application of the Heil line of road machinery and the standard lines of dump bodies and hoists. In addition, there will be shown the Heil Slant Type Single Cylinder Hoist, the famous line of Heil Twin-Cylinder Hydraulic Hoist units, and the Heil Telescopic Model Hoist for mounting inside the frame, as well as the Straddle Mount unit of Telescopic design for mounting outside the frame on trailer units, six-wheel truck models, and sundry other applications. Refinements and improvements of the 1939 Models of Heil Dig-N-Carry Scrapers will be graphically illustrated. A new bulletin, showing these items in detail, will be available. The newest addition to the line, a 15-yd., self-loading scraper, will be shown in a series of photographs during its test runs. Jos. F. Heil, Executive Vice President; Charles Eisenberg, Engineer; E. C. Gilmore, T. A. Miller, H. A. Stoller, of the Sales Department; and Steve Faatz.

Hercules Motor Corp.—B-52. Few representative sizes of complete line of Modern High-Speed, Heavy-Duty Internal Combustion Engines and Power Units, both gasoline and Diesel. John C. Kepfinger, Vice President in Charge of Sales; O. W. Latta, Sales Mgr.; and Oliver S. Kelly, West Coast Factory Rep. Hotel headquarters: Palace Hotel.

Iowa Mfg. Co.—B-23. Pictures, etc. No machinery. Howard Hall, President; Kenneth Lindsay, Vice President-Sales Mgr. Hotel headquarters: St. Francis.

The C. S. Johnson Company—A-2. Photographs of various large Construction Job Batching plants. C. G. Johnson, President.

Kinney Manufacturing Co.—B-43. Kinney Jacketed Pump, Special Spray Bar, Special Tank and Insulation Details. Photographs. William E. Worcester, Vice President in Charge of Sales; Dean J. Hill, Mgr., Los Angeles Branch. Hotel headquarters: Hotel Whitcomb.

Le Roi Company—B-27. Air Compressors, Engines. W. R. Karll, Sales Mgr.; M. L. Hewett, Sales Engineer; S. L. Warwick, Sales Engineer. Hotel headquarters: Whitcomb.

A. Leschen & Sons Rope Co.—B-35. Exhibit will consist of: Complete line of samples of "Hercules" (Red Strand) Wire Rope. C. X. Henning, San Francisco Mgr.; Elliott Derico and Andrew E. Tingvall, Reps.

R. G. Le Tourneau, Inc.—B-50. Literature table with exhibit of Power Control unit. E. R. Galvin, Gen. Sales Mgr.; Denn M. Burgess, Gen. Mgr.; John R. Bryan, West Coast Sales Mgr.; Mr. Collins, Special West Coast Rep; and several others of

Western Sales Force. Hotel headquarters: Whitcomb and Metropolitan.

Lincoln Engineering Co.—B-56. Lubricating Equipment for Contractors' and Road Builders' Machinery. C. Homer Redd, Pacific Coast Sales Mgr.; Ross Kelly McCoy, Factory Representative.

Littleford Bros.—B-42. No actual equipment, but booth will feature "Motorized Wheeled Roller." L. W. Glaser, Sales Mgr. Hotel Headquarters: Sir Francis Drake.

Mall Tool Company—B-55. Mall full width highway vibrator; various models of gas engine, air and electrically-operated concrete vibrators; gas engine and electric surfacing machines with attachments for sawing, sanding, drilling and pumping; portable electric saws; portable electric drills. A. W. Mall, President; James Simkins, Los Angeles Office Representative.

Michigan Malleable Iron Co.—C-18. Safety Stop Signs, and Swing Sign Brackets. P. E. Haultain, Representative for California.

Novo Engine Co.—B-41. Three new Pumps, 1 Diaphragm Pump, 2 Self-Priming Centrifugals. Photo display of new Road Pump and Pavement Breaker. R. B. Harvey, Sales Mgr.; E. P. Teel, Gen. Mgr. Hotel headquarters: St. Francis Hotel.

The Owen Bucket Company—19. One small OWEN Type "M" Clamshell Bucket; a working model of OWEN Type "RA" Rock Grapple, in operation. E. W. Botten, Secretary and Treasurer; E. L. Kelzer, Western Manager. Hotel headquarters: St. Francis.

Pioneer Engineering Works, Inc.—B-66. Super-40 Roll Crusher, 4-ft. x 12-ft. Vibrating Screen. Model Jaw Crusher. L. W. Yerk, President; K. E. Brunsdale, Secretary and Treasurer; J. A. Hanratty, Western Sales Manager.

Portland Cement Association, Booth No. —. Photographic enlargements, color illustrations of highway, street and airport improvements. A. A. Anderson, Mgr., Highways and Municipal Bureau; H. D. Barnes, Regional Highway Engineer. Hotel headquarters: St. Francis Hotel.

Prismo Safety Corp., Division of John R. Wald Co., Booth No. —. Tunnel type Visualizer, Reflecting Signs and Markers. Paul A. Preus, Gen. Mgr.; C. S. McNulty, Engineer. Hotel headquarters: Whitcomb.

Ransome Concrete Machinery Co.—C-5. Two 10-S Mixers, 1 3½S Mixer, Truck Mixer Model. L. R. Wilson, Agency Mgr.; A. P. Robinson, Vice President and Sales Mgr. Hotel headquarters: St. Francis Hotel.

Raylig Division, Rayonier, Inc.—A-10. Raylig Road Binder display, featuring project photographs, samples, literature, and continuous motion pictures of road construction and maintenance with Raylig. W. G. Drummond, Mgr., Ralig Division, Rayonier, Inc.; Kirby Torrance, President, Western Road Binder Co., Raylig Sales Agents; L. L. DeWalsley, Vice President and Sales Engr., Western Road Binder Co. Hotel headquarters: Whitcomb Hotel.

W. A. Riddell Corp., Bucyrus, O.—B-25. Booth display of models and photographs of Motor Graders, Drawn Graders, Rollers, Spreaders and Scoops. Clark Tod McConnell, President; N. E. Jersey, Vice President and General Manager. Hotel headquarters: St. Francis.

Schramm, Inc.—B-31. Model 105 Schramm "Utility" Portable Compressor, Cut-Away Compressor; block showing details of construction of Pneumatic Tools. H. N. Schramm, President; W. L. Home, District Rep. Hotel headquarters: Drake-Wilshire.

Simplicity System Co.—B-10. Complete working model of an asphalt plant.

The Sisalkraft Co.—A-26. Sisalkraft for Protection on Soil Stabilization, Concrete Curing; Roads, Walks and Curbs. Franklin A. Richards, Manager, Road Dept.; P. M. Olsen, Western Manager.

Spicer Manufacturing Corporation—B-51. 6031 Auxiliary Transmission, 6031 Top Mounted Power Take Off, assembled to the Auxiliary Transmission; 7341 Transmission, eight (8) different models of Power Take Offs, including single speed, reverse, and two speeds forward, and reverse Take Offs; Power Take Off Joints, 1600 size propeller shaft, short coupled joint, 1500 size cut-away joint and stub shaft, cross-sectional display of 13-in., Two Plate Clutch and 14-in. Single Plate Clutch. Wm. Fairhurst, Vice President and Sales Mgr.; C. D. Peterson, Executive Engineer; H. S. Watson, M. R. Murphey, Frank House, Western Representatives.

Standard Oil Company of California—B-62. Pistons, liners, bearings and labora-

tory apparatus to illustrate service properties and new "RPM" Diesel Engine Lubricating Oil—its non-corrosiveness, anti-rusting and anti-filter clogging valve. J. C. Handy, H. G. Vesper, Assistant Managers, Lubricant Division; G. L. Neely, Research Engineer; and J. A. Blood, Manager, Asphalt and Contractor Sales Division. Headquarters: Standard Oil Building, 225 Bush St., San Francisco.

Sterling Machinery Corp.—B-48. One 1000-watt Unitype Electric Generating Plant; one 2-in. Model 10M Pumping Unit; one 3-in. Model 20M Pumping Unit; one 4-in. Self-Priming Centrifugal Pump, mounted on double ball-bearing support head and arranged for belt drive; and a number of large blow-ups, showing other equipment. R. G. Barzen, Secretary and Treasurer, and R. C. Cameron, Sales Manager. Hotel headquarters: Sir Francis Drake Hotel.

Stewart-Warner Corporation, Alemite Div.—A-1. Alemite Portable Service Station. Lubrication Equipment, Lubricants for construction industry. C. I. Kraus, Sales Representative, Alemite Div., Stewart-Warner Corp., Chicago; J. M. Carson, Sales Representative, Alemite Div., Stewart-Warner Corp., Chicago; E. R. Boyd, C. C. Revis, G. D. Wright, W. S. Bryant, J. H. Elliott, T. C. Lukey, E. H. Reynolds (all of Alemite Co. of Northern California, 1170 Howard St., San Francisco, Calif.). Hotel headquarters: St. Francis Hotel.

Toncan Culvert Mfg. Asso.—B-24. Toncan Corrugated Metal Pipe, Toncan "Corwell" Pipe, Toncan Sectional Plate Arch. L. W. Fletcher, Sales Engineer. Hotel headquarters: St. Francis.

Toro Manufacturing Corp.—B-6. Tractor Mowers, Highway Mowers, Gang Mowers, Power Mowers. K. E. Golt, Sales Manager, and M. R. McLaren, Service Manager. Hotel headquarters: St. Francis Hotel.

Truscon Steel Co.—B-24. A display 36 feet in length, graphically illustrating the "innards" of a concrete highway properly reinforced with steel products. Kenneth D. Mann, Executive Vice President; C. B. McGehee, Manager of Sales, Highway Prod. Division; R. P. Dodds, Mgr., Advertising and Sales Promotion; Jack London, District Sales Manager, San Francisco office. Hotel headquarters: Hotel Whitcomb.

Union Metal Mfg. Co.—C-10. Monotube Piling, Bridge Lighting Standards, Highway Lighting Standards. W. A. Porterfield, Vice President; R. G. Vanden Boon, Western Dist. Mgr.; E. Zimmerman, San Francisco Mgr. Hotel headquarters: St. Francis Hotel.

Viber Company—B-49. Internal Concrete Vibrators, electrically pneumatic or gas engine operated. E. B. Jorgensen, General Manager; C. W. Pierce, Chief Engineer; Arthur P. Denton, San Francisco Distributor. Hotel headquarters: St. Francis.

S. K. Wellman Co.—C-7. Velvetouch Bimetallic Clutch Facings. R. A. Goodwin and W. E. Canfield. Hotel headquarters: Gotham.

White Manufacturing Company—B-12. Concrete Vibrators and large photographs of Portable Asphalt Plants, Heating Kettles, Kerosene Torches, Tractor Loaders, Lawn Rollers, etc. W. McK. White, President, and C. G. White, Vice President.

Wico Electric Co.—B-58. High Tension Wico Magneto, Neon sign operated by Wico six-cylinder Magneto; also a Wico Magneto moulded from transparent material, operating to show moving parts. H. L. Hart, General Sales Manager; V. T. Chevallier, Western District Manager. Hotel headquarters: Hotel Whitcomb.

Wisconsin Motor Corporation—A-19. Construction and Industrial Air-Cooled Engines. H. A. Todd, President; Harry Cronk, Vice President and Sales Manager, and Phil Norton, Sales Representative. Hotel headquarters: St. Francis Hotel.

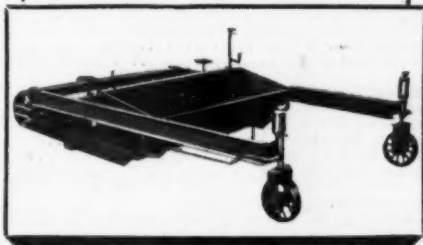
Gar Wood Industries, Inc.—B-33. Miniature Gar Wood telescopic hoists and Boulder Dam type of rock body.

Woodridge Company—A-13. Cable Controlled Power Units, Cut-Away Parts, on the inside of the Auditorium. A display of scrapers—4, 6, 8, 12, 15, 20 and 25-yard capacity, in an outside display directly across from the Auditorium on Larkin St., as well as bulldozers, trailbuilders, rippers, etc. The main attraction of this display we expect will be the novel way of tandeming two 25-yard Woodridge "Terra-Clipper" scrapers. H. Gusman, Pres.; Mack Woodridge, Vice President and General Manager; Nolan Barr, Northern California Representative; Robert H. Fox, Manager, Los Angeles Branch; Jimmy Hope, Sales Representative. Hotel headquarters: Whitcomb Hotel.



Handles all types of road surfacing and base material with greater speed and in accurate volumes. It spreads and automatically grades in one operation and there are no low or high spots when resurfacing.

The new D-K Spreader and Finisher and Bituminous Paver means profits to the Contractor because of its economical operation and satisfaction to the Highway Engineer because of the uniformity and smoothness of the completed job.



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Lays smoother roads faster and cheaper than machines twice the cost.

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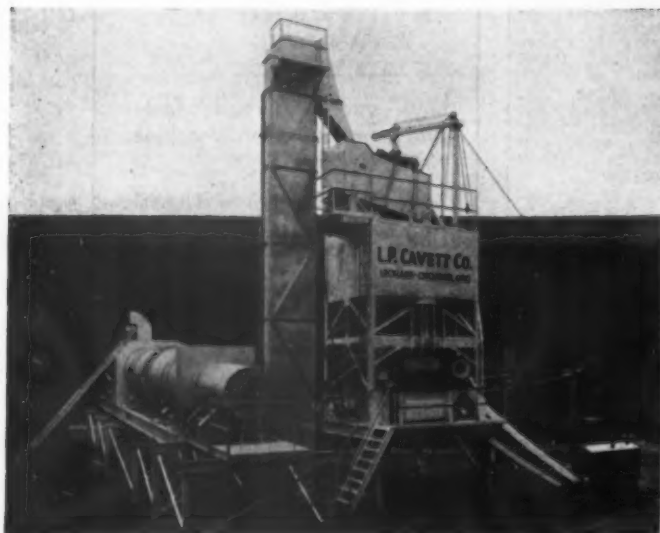
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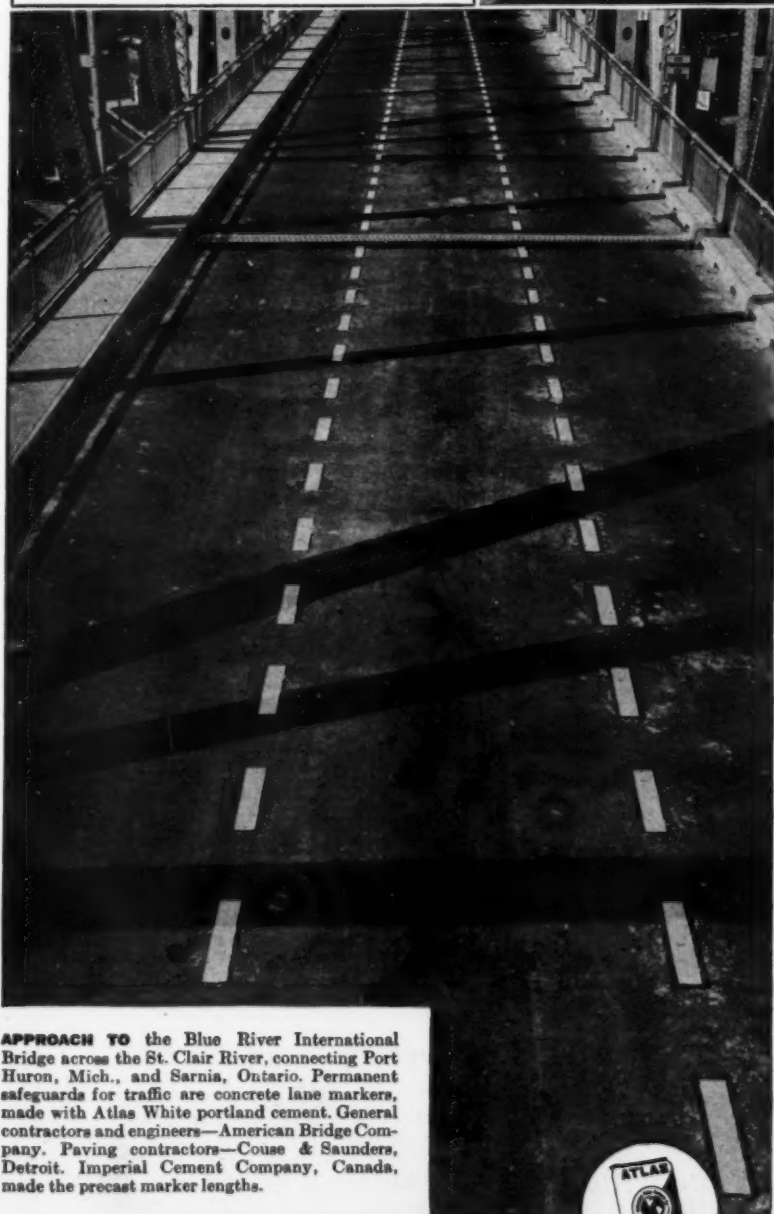
HETHERINGTON & BERNER INC.

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INDIANAPOLIS, INDIANA

*Over this Blue Water
International Bridge
to Canada*



APPROACH TO the Blue River International Bridge across the St. Clair River, connecting Port Huron, Mich., and Sarnia, Ontario. Permanent safeguards for traffic are concrete lane markers, made with Atlas White portland cement. General contractors and engineers—American Bridge Company. Paving contractors—Couse & Saunders, Detroit. Imperial Cement Company, Canada, made the precast marker lengths.



TWO DOTTED LINES OF WHITE CONCRETE are permanent traffic guides

WHEN the King and Queen of England dedicate this highway link between the United States and Canada, they will see a structure that possesses outstanding factors of safety.

Motorists who travel over this cantilever crossing are now appreciating one important safety feature—traffic *markers* of white concrete. Exposed to every whim and onslaught of the weather, these markers, made with Atlas White portland cement, will keep their whiteness. Their hard, white surface will never require painting, repairing or replacing. Precast in short lengths, they were easy to install. And they will be permanent guides to traffic.

More and more highway and safety officials are deciding today that it pays to use markers (and curbing) made with white concrete. They are learning that this is one sure way to eliminate maintenance costs, keep traffic running smoothly, and reduce accidents. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

RS-M-4

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ROADS and STREETS

With which have been merged GOOD ROADS and ENGINEERING & CONTRACTING

Published Monthly by
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CHICAGO, ILLINOIS



THIS MAGAZINE IS DEVOTED TO
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of Highways, Streets, Bridges and Grade
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